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Campbell et al.

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(45) **Date of Patent: Jul. 28, 2009**

(54) **TRANSFER SERVER OF A SECURE SYSTEM FOR UNATTENDED REMOTE FILE AND MESSAGE TRANSFER**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1042 days.

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(22) Filed: **Jun. 29, 2004**

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Related U.S. Application Data

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(51) **Int. Cl.**
G06F 21/00 (2006.01)

(52) **U.S. Cl.** **726/4**; 726/5

(58) **Field of Classification Search** 726/5; 713/155, 165, 168, 170

See application file for complete search history.

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Primary Examiner—Gilberto Barron, Jr.
Assistant Examiner—Samson B Lemma
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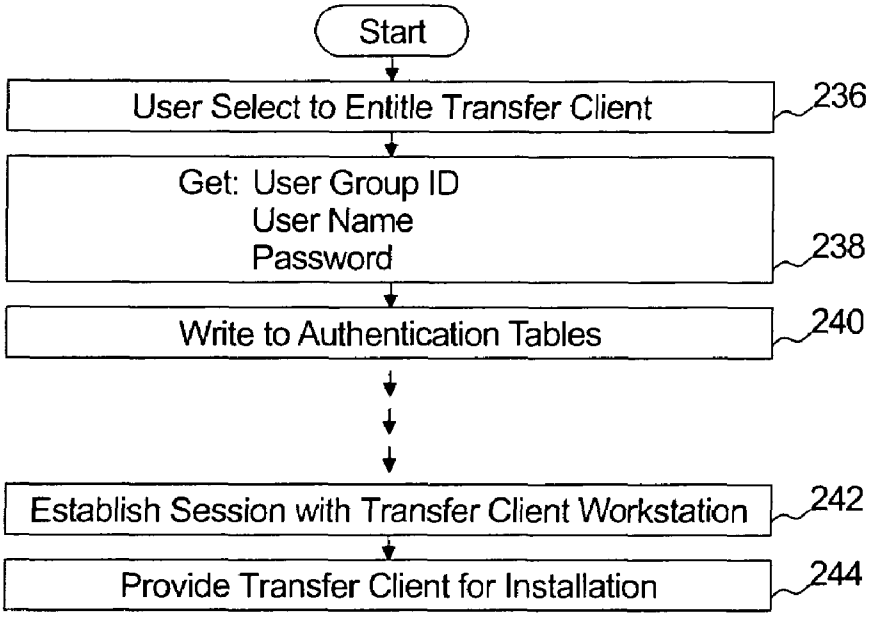
(57) **ABSTRACT**

A web server system provides for the secure exchanging files with a remote transfer server over an open network such as the Internet. The transfer server operates a plurality of transfer methods. Exemplary transfer methods comprise: i) a log-on method operated comprising steps for returning a session ID to an authenticated transfer client; ii) an active event keys method comprising steps for returning each of a plurality of event keys associated with the transfer client; iii) a read event method comprising steps for returning event parameters associated with an event identified by its event key, iv) a create binary object event comprising steps for extracting data from an application database, storing a binary object of the extracted data, and recording the binary object in an ownership table, v) a check availability method for determining whether a binary object matching a class exists; and vi) an download method comprising steps for sending a message to the transfer client which includes a binary object identified in a request from the transfer client.

6 Claims, 17 Drawing Sheets



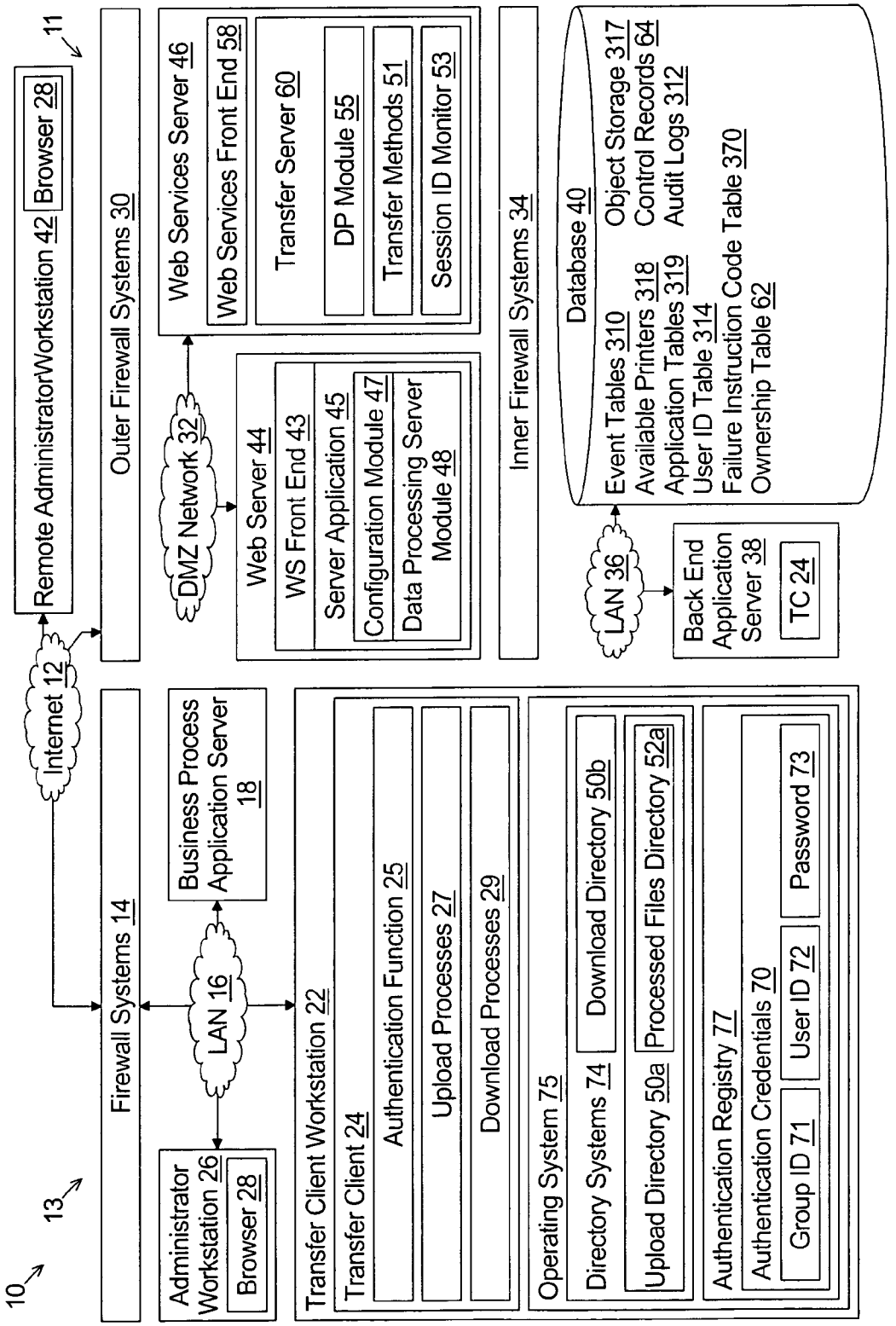

10
13
Internet 12
Remote AdministratorWorkstation 42
Browser 28
11
Outer Firewall Systems 30
Firewall Systems 14
Administrator Workstation 26
Browser 28
LAN 16
Business Process Application Server 18
Transfer Client Workstation 22
Transfer Client 24
Authentication Function 25
Upload Processes 27
Download Processes 29
Operating System 75
Directory Systems 74
Download Directory 50b
Upload Directory 50a
Processed Files Directory 52a
Authentication Registry 77
Authentication Credentials 70
Group ID 71
User ID 72
Password 73
DMZ Network 32
Web Server 44
WS Front End 43
Server Application 45
Configuration Module 47
Data Processing Server Module 48
Web Services Server 46
Web Services Front End 58
Transfer Server 60
DP Module 55
Transfer Methods 51
Session ID Monitor 53
Inner Firewall Systems 34
LAN 36
Back End Application Server 38
TC 24
Database 40
Event Tables 310
Object Storage 317
Available Printers 318
Control Records 64
Application Tables 319
Audit Logs 312
User ID Table 314
Failure Instruction Code Table 370
Ownership Table 62

Figure 1

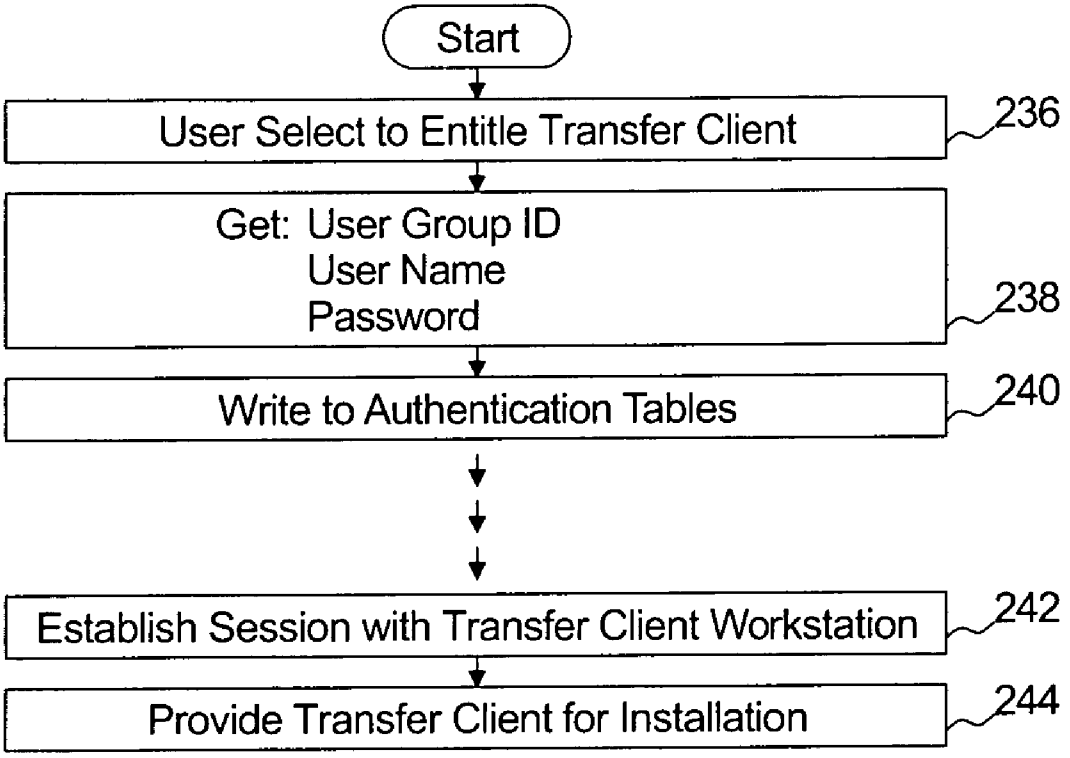

Start
User Select to Entitle Transfer Client
236
Get: User Group ID
User Name
Password
238
Write to Authentication Tables
240
Establish Session with Transfer Client Workstation
242
Provide Transfer Client for Installation
244

Figure 2

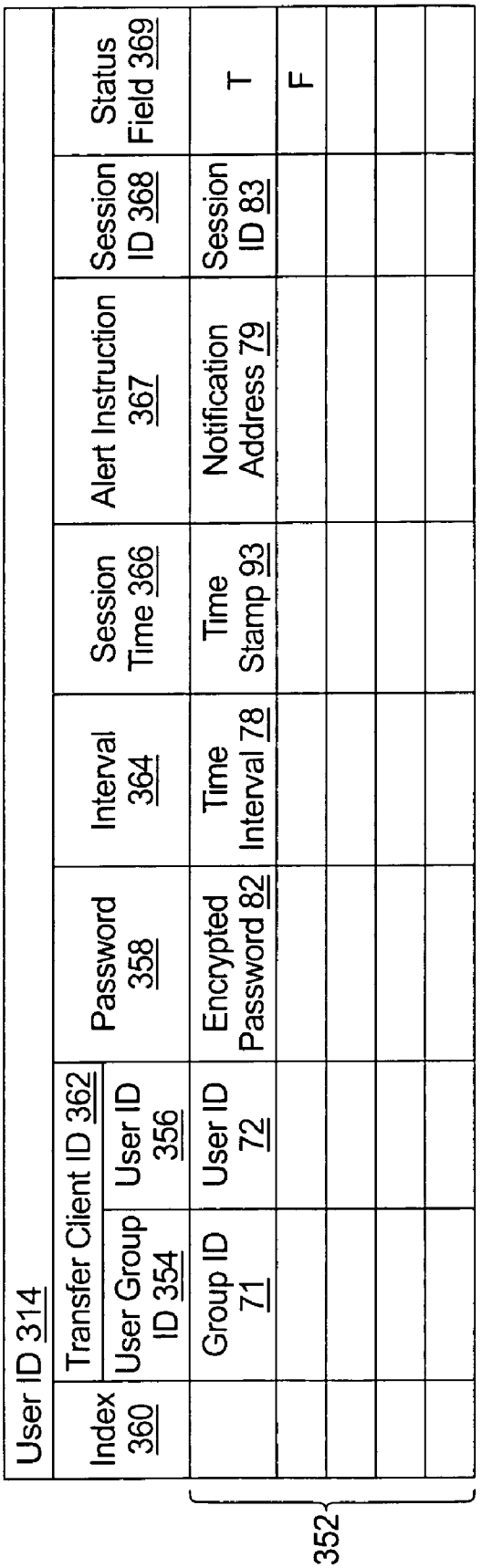


Figure 3

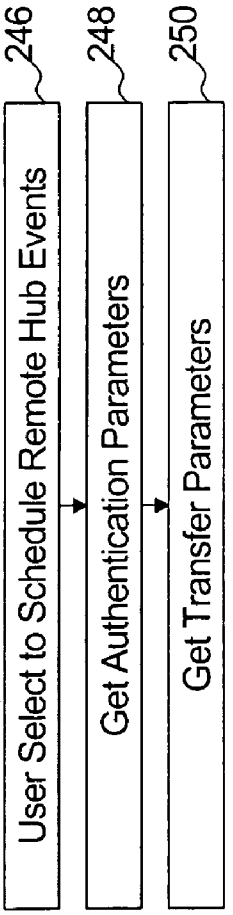


Figure 4

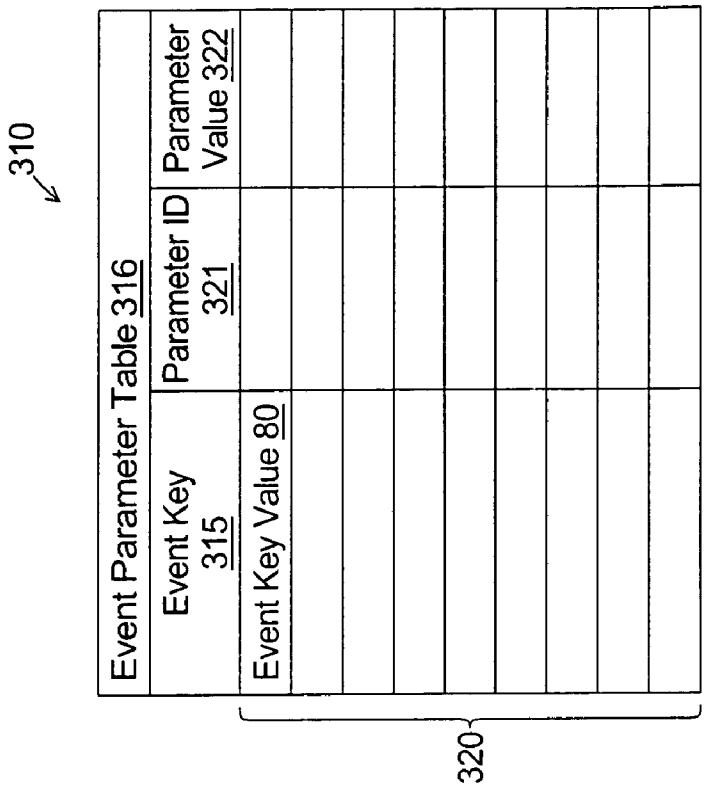


Figure 5b

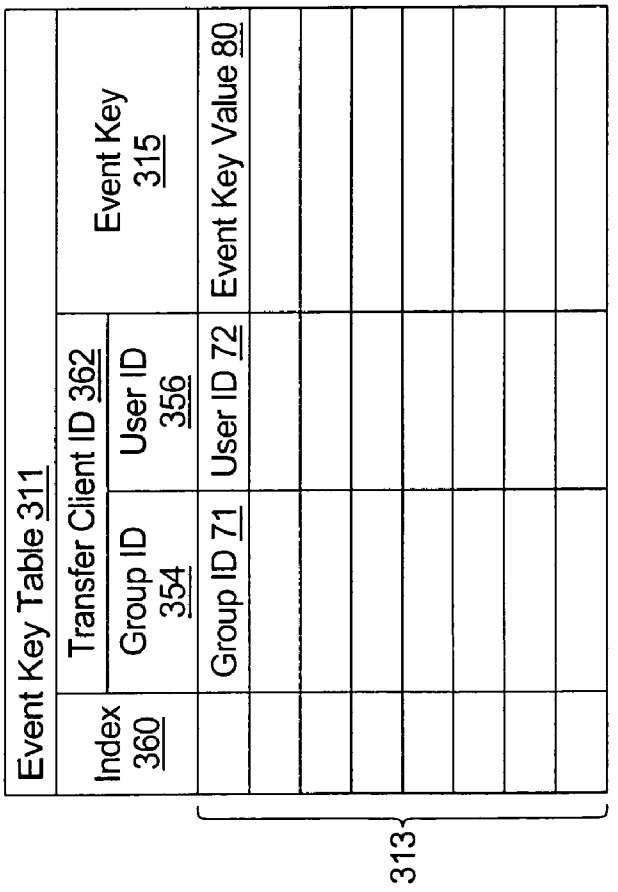
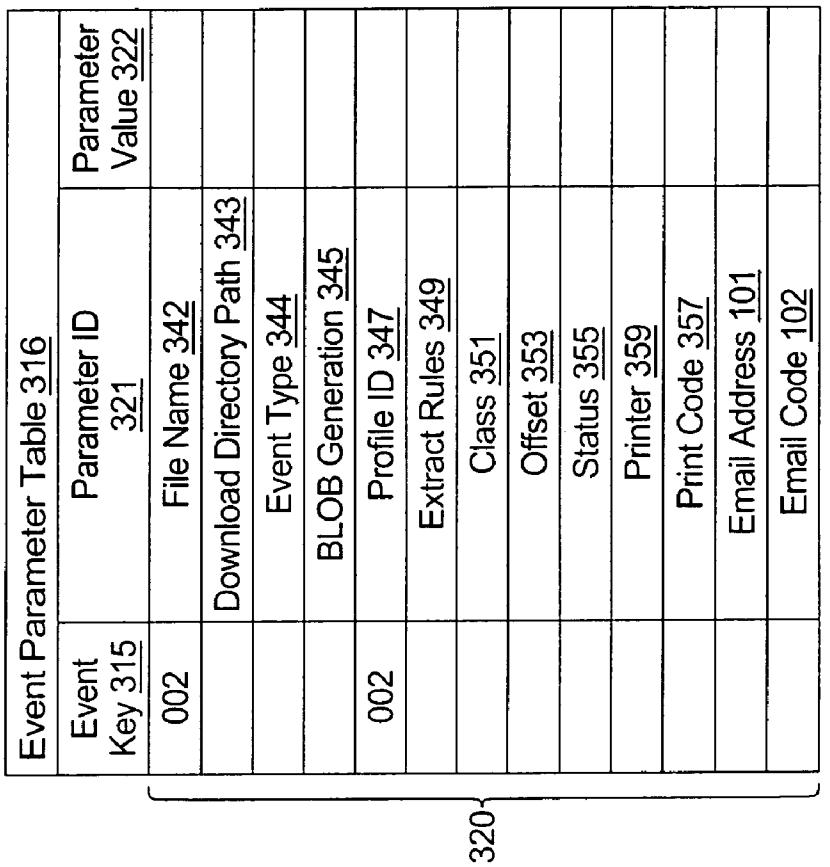


Figure 5a



Event Parameter Table 316		
Event Key 315	Parameter ID 321	Parameter Value 322
002	File Name 342	
	Download Directory Path 343	
	Event Type 344	
	BLOB Generation 345	
002	Profile ID 347	
	Extract Rules 349	
	Class 351	
	Offset 353	
	Status 355	
	Printer 359	
	Print Code 357	
	Email Address 101	
	Email Code 102	

320

Figure 5d

Event Parameter Table 316		
Event Key 315	Parameter ID 321	Parameter Value 322
001	File Name 323	
001	Upload Directory Path 324	
001	BLOB Handling 326	
001	Destination Group ID 325	
001	BLOB Loading Rules 327	
001	Status 328	
	Email Address 101	
	Email Code 102	

320

Figure 5c

100

Email Codes 102	
Code	Description
01	No Email Notification
02	Send on Success
03	Send on Failure
04	Send on Success or Failure

Figure 6

374

Available Printers 318			
Index	Group ID 354	User ID 356	Printer ID 378
			Printer ID 81

Figure 7

Transfer Methods 51	Parameters
Check Status	User Group, User ID
Log On	User Group, User ID, Password
Get Password	Session ID
Send Printers	Session ID, Printers IDs
Retrieve Active Event Keys	Session ID
Read Event	Session ID, Event Key
Update Event	Session ID, Event Key, Status Information, Offset
Create BLOB	Session ID, Profile ID, Extract Rules
Check for Available BLOB	Session ID, Class, Offset
Download BLOB	Session ID, BLOB ID
Upload File	Session ID, File Name, BLOB Contents
Set Destination BLOB Owner	Session ID, BLOB ID, User Group
Process BLOB	Session ID, BLOB ID, Loading Rules

Figure 8

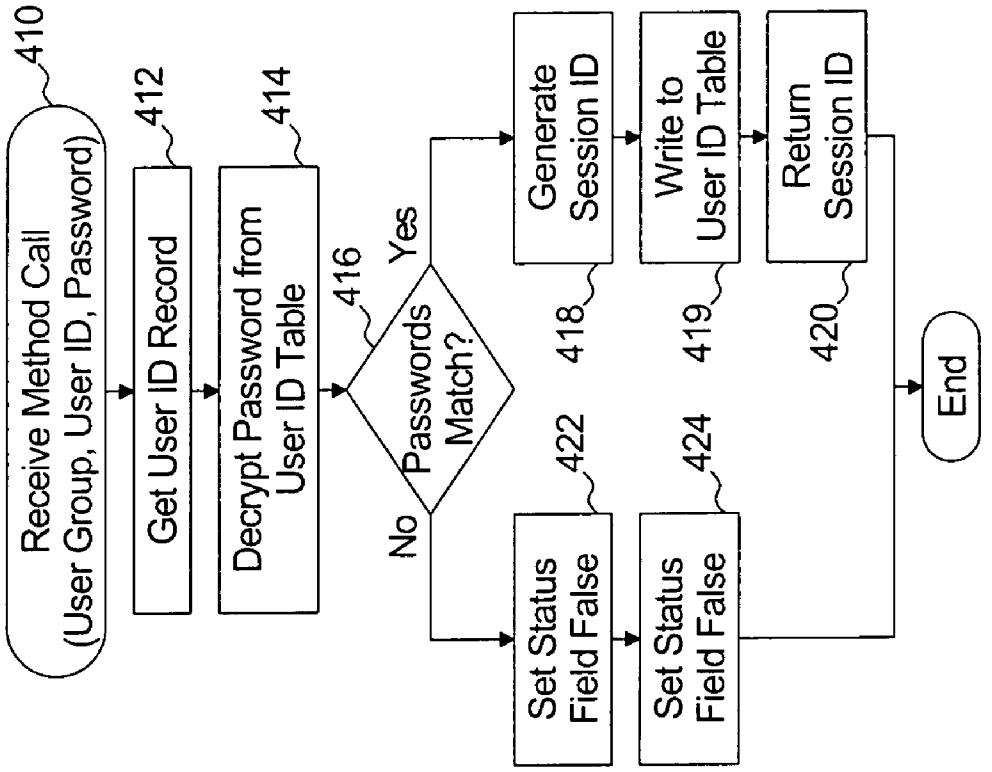


Figure 10
(Log On)

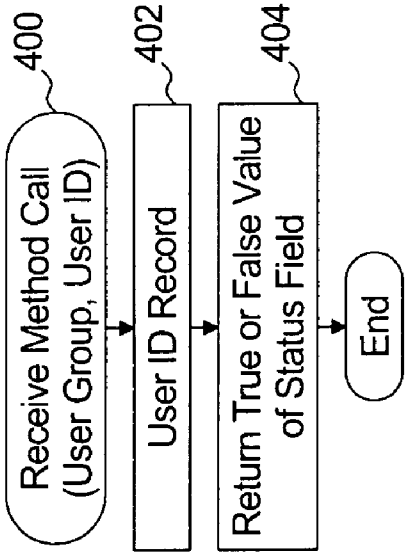


Figure 9
(Check Status)

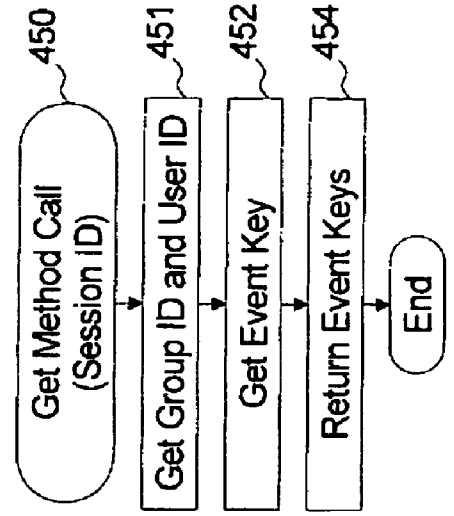


Figure 11
(Get Password)

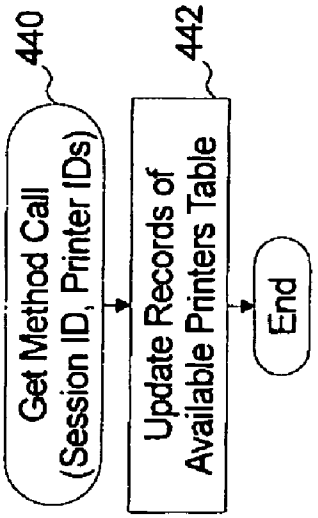


Figure 12
(Send Printers)

Figure 13
(Retrieve Active Event Keys)

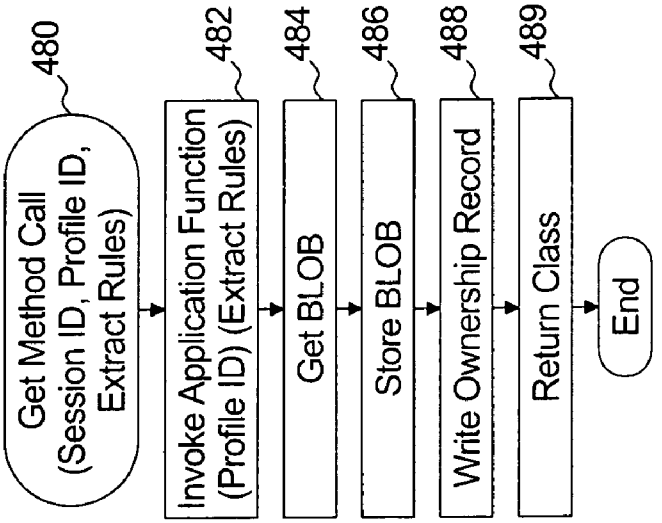


Figure 14
(Read Event)

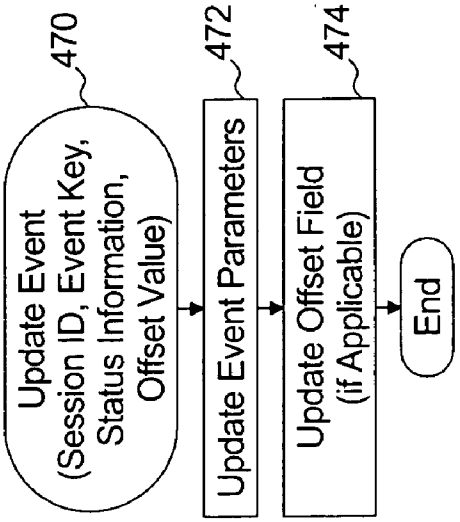


Figure 15
(Update Event)

Figure 16
(Create BLOB)

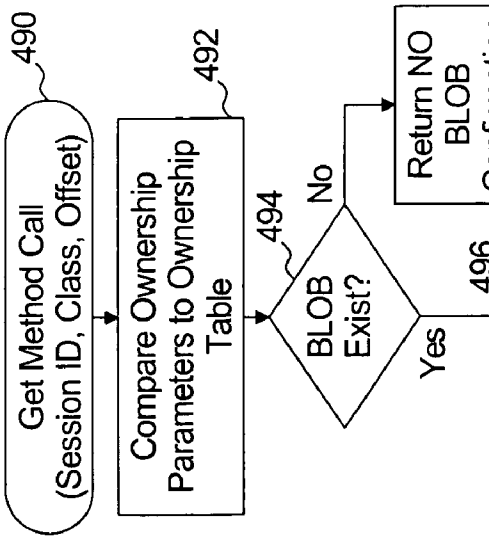


Figure 17
(Check for Available BLOB)

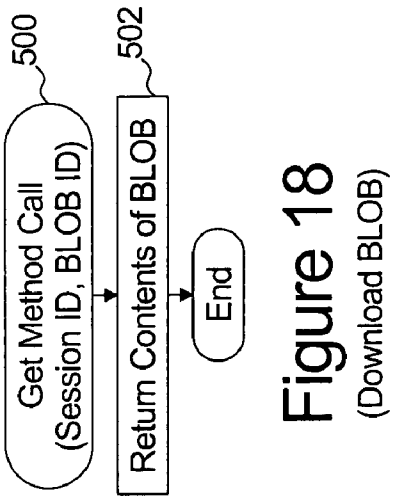


Figure 18
(Download BLOB)

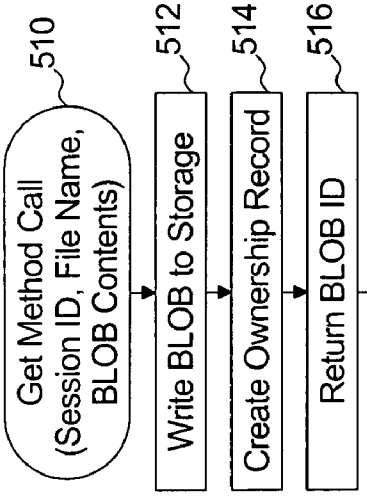


Figure 19
(Upload File)

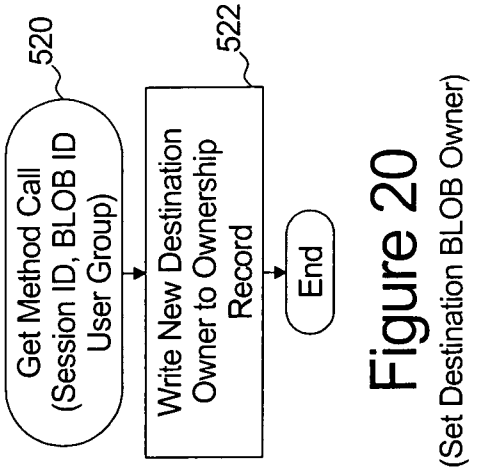


Figure 20
(Set Destination BLOB Owner)

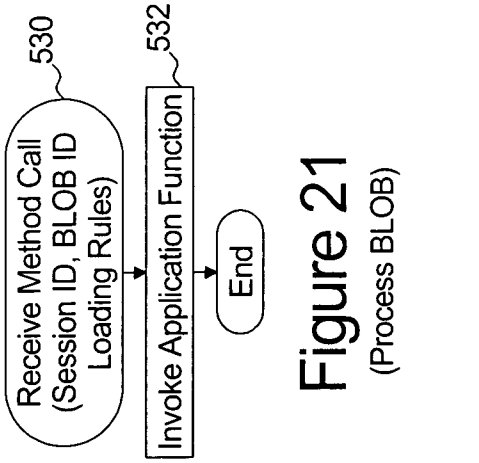


Figure 21
(Process BLOB)

Ownership Table 62					
Index	BLOB ID Field 85	Class Field 86	Destination Group ID Field 87	Offset Field 88	63
	BLOB ID 89	Class Value 90	Destination Group ID 91	Offset Table 92	

Figure 22

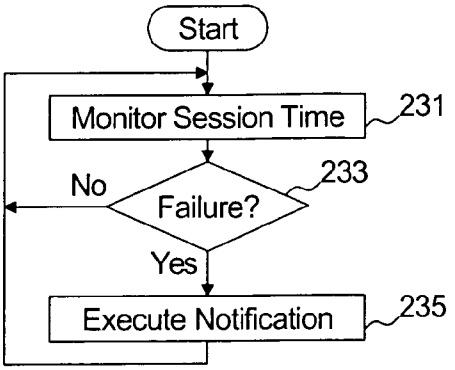


Figure 23

Local Processes 23		
Index	Process	Parameters
1	Check Status	User Group, User ID, Password
2	Session ID	User Group, User ID, Password
3	Get Password	Session ID
4	Send Printers	Session ID, Printers IDs
5	Retrieve Active Event Keys	Session ID
6	Read Event	Session ID, Event Key
7	Update Event	Session ID, Event Key, Status Information, Offset
8	Create BLOB	Session ID, Profile ID, Extract Rules
9	Check for Available BLOB	Session ID, Class, Offset
10	Download BLOB	Session ID, BLOB ID
11	Upload File	Session ID, File Name, BLOB Contents
12	Set Destination BLOB Owner	Session ID, User Group
13	Process BLOB	Session ID, BLOB ID, Loding Rules
14	Save Password	Password
15	Create and Write File	File Name
16	Read File	File Name
17	Send to Printer	Printer ID, File Name
18	Rename File	Old File Name, New File Name

Figure 24

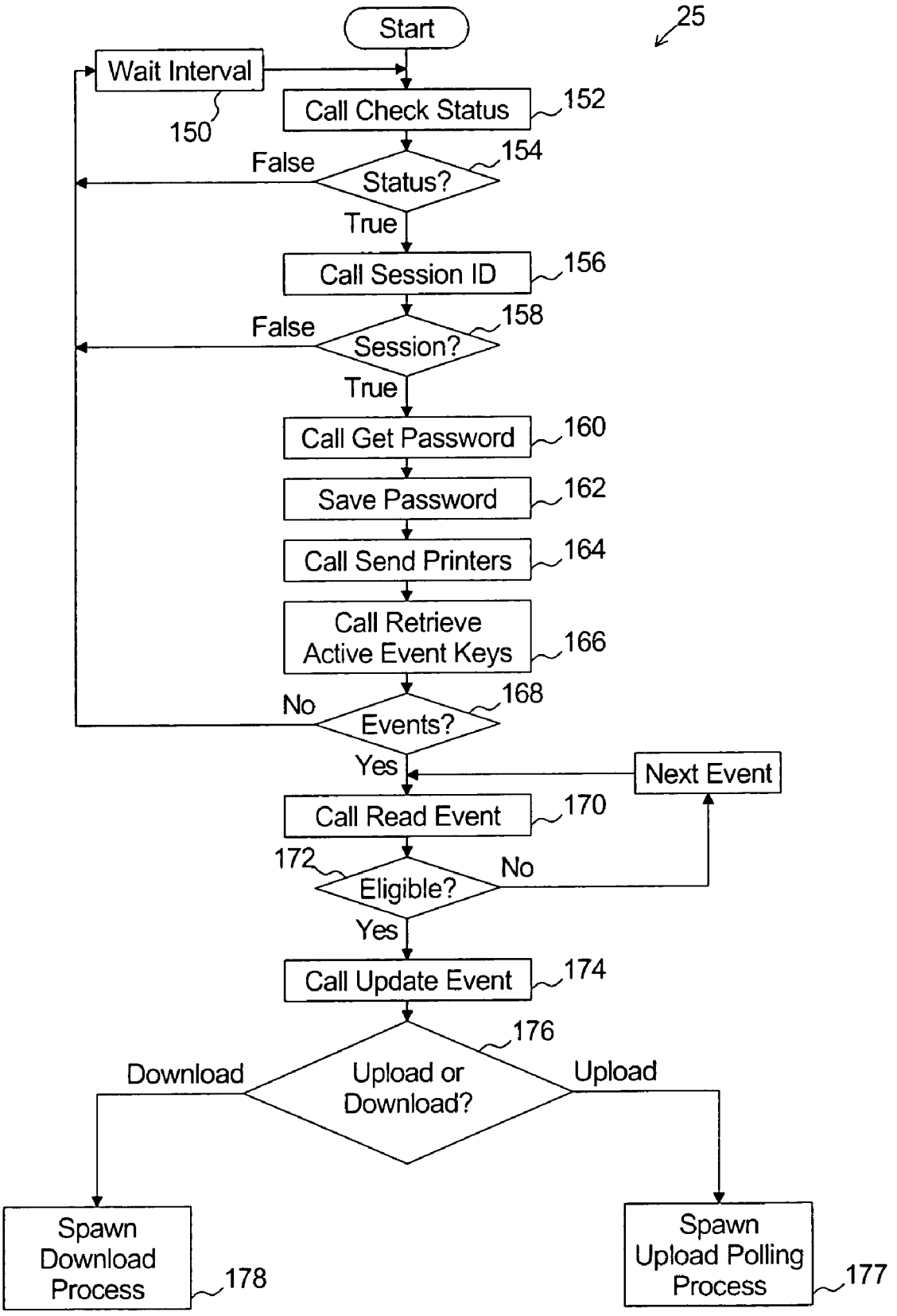

25
Start
Wait Interval
150
Call Check Status
152
False
Status?
154
True
Call Session ID
156
False
Session?
158
True
Call Get Password
160
Save Password
162
Call Send Printers
164
Call Retrieve Active Event Keys
166
No
Events?
168
Yes
Next Event
Call Read Event
170
172
Eligible?
No
Yes
Call Update Event
174
176
Download
Upload or Download?
Upload
Spawn Download Process
178
Spawn Upload Polling Process
177

Figure 25

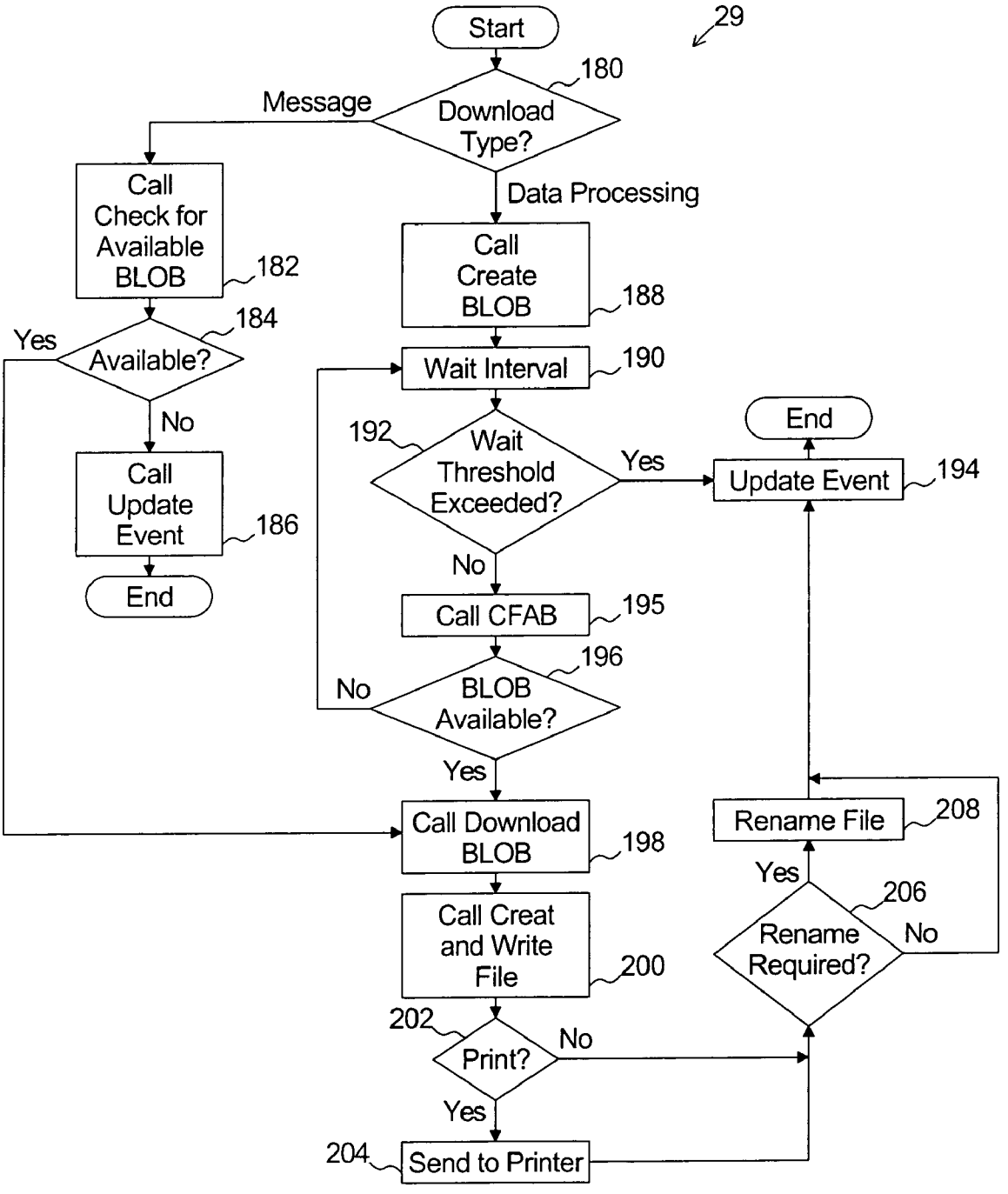

29
Start
180
Download Type?
Message
Data Processing
Call Check for Available BLOB
182
Available?
184
Yes
No
Call Update Event
186
End
Call Create BLOB
188
Wait Interval
190
192
Wait Threshold Exceeded?
Yes
No
End
Update Event
194
Call CFAB
195
196
BLOB Available?
No
Yes
Call Download BLOB
198
Call Creat and Write File
200
202
Print?
No
Yes
204
Send to Printer
Rename File
208
Yes
206
Rename Required?
No

Figure 26

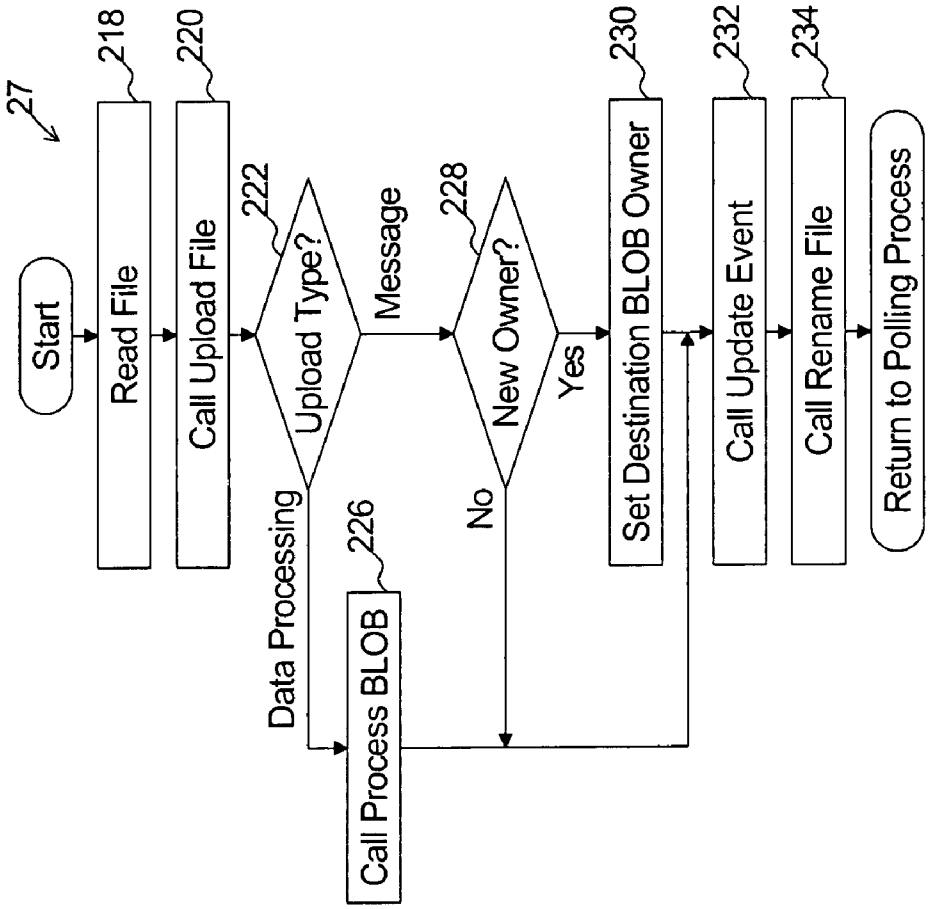


Figure 27b

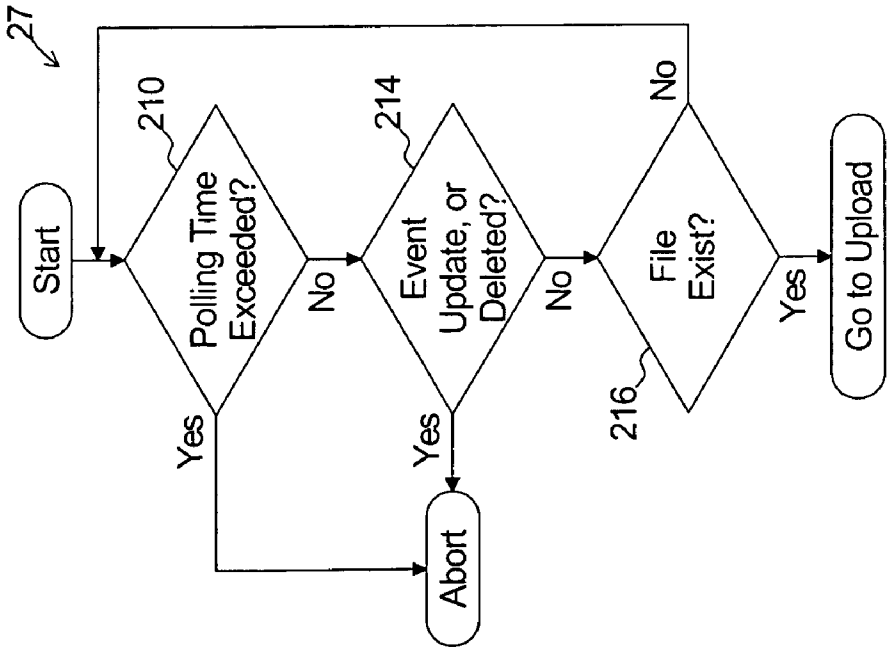


Figure 27a

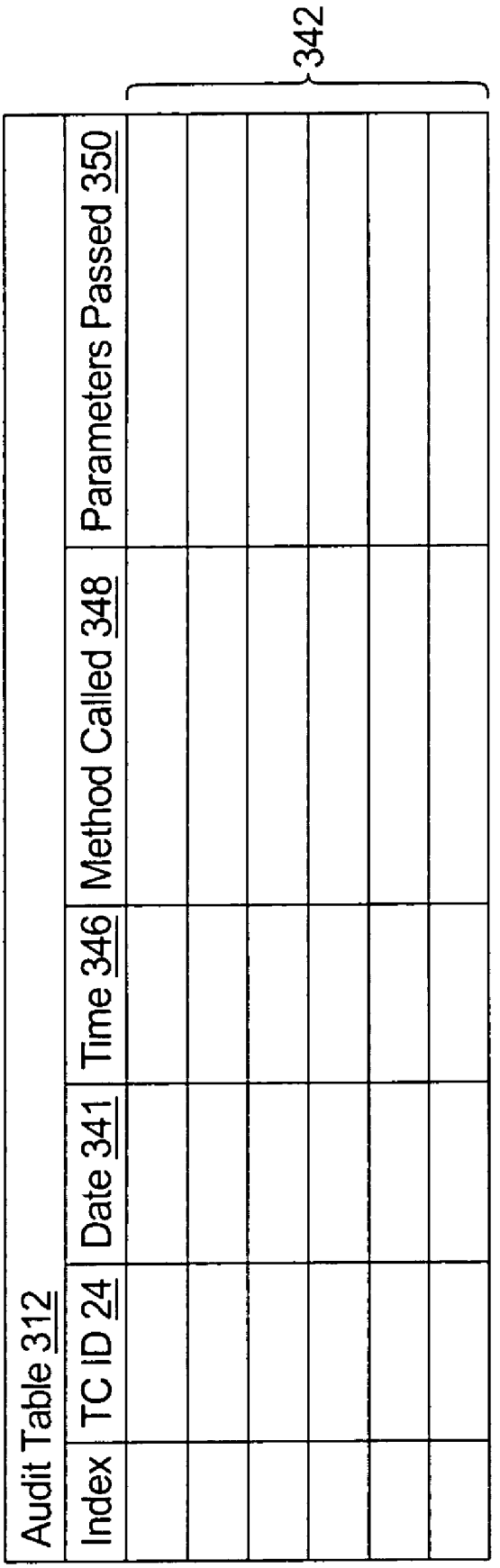

342
Audit Table 312
Index
TC ID 24
Date 341
Time 346
Method Called 348
Parameters Passed 350

Figure 28

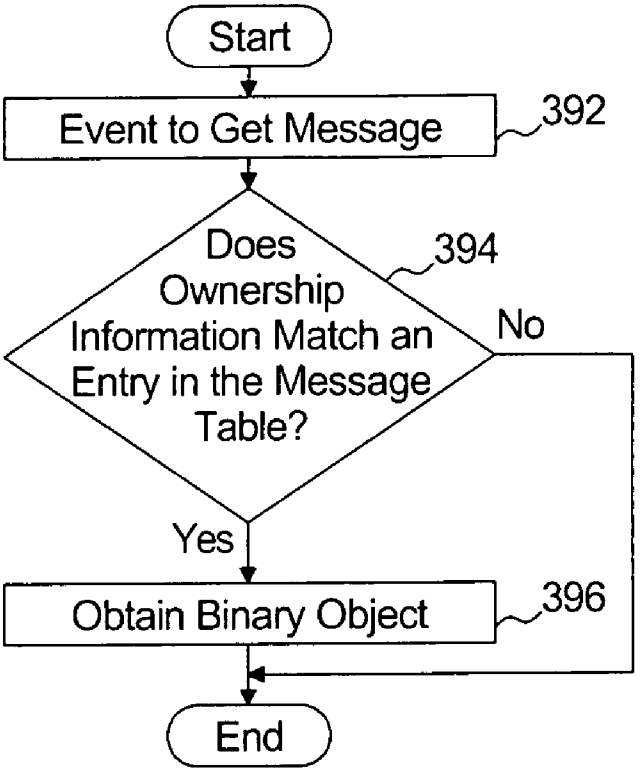


Figure 29a

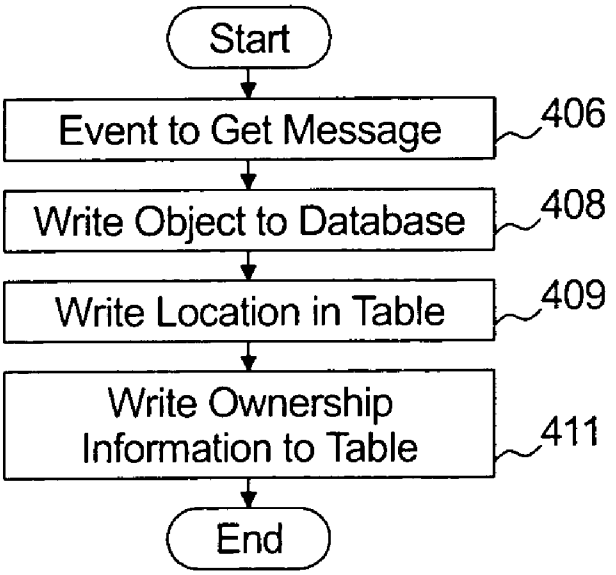


Figure 29b

TRANSFER SERVER OF A SECURE SYSTEM FOR UNATTENDED REMOTE FILE AND MESSAGE TRANSFER

CROSS REFERENCE TO RELATED APPLICATIONS

The present application is a continuation in part of U.S. patent application Ser. No. 10/041,513 entitled Automated Invoice Receipt and Management System with Field Value Substitution filed on Jan. 8, 2002 now abandoned and is a continuation in part of U.S. patent application Ser. No. 10/139,596 entitled Automated Invoice Receipt and Management System with Automated Loading Systems filed on May 6, 2002.

TECHNICAL FIELD

The present invention relates to the exchange of data files over an open network, and more particularly, to a secure system and method for the automated exchange of data files with a web server.

BACKGROUND OF THE INVENTION

Database systems have long been used by businesses to record their commercial interactions with customers, vendors, financial institutions, and other third parties. Most database applications are transaction based—meaning that the application obtains all required data for a particular transaction before the transaction is written to the database.

Since the early days of database systems, it has long been a goal to automate the transfer of data between the business's computer systems and those of the other third parties. Early methods of transferring data between data base systems included exporting data (in accordance with a defined report) from a first system onto a magnetic tape or other data media. The data media is then physically transferred to a second system. While such a system was an improvement over manual entry of data, several draw backs existed. First, physical transfer of the data media could take a significant amount of time if mail or courier was used. Secondly, the three steps of writing the data file to the data media, transferring the data media, and loading the data file from the data media all required human intervention to be properly performed. Thirdly, both the application on the first system and the application on the second system had to be compatible—or, stated another way, the data file written to the data media by the first system had to be in a format that could be read and loaded into the second system.

Development of modems, value added networks (VAN), and Internet networking in general significantly improved the data transfer process. Rather than physically transferring a data file on magnetic tape or other data media, the data file could be transferred using a dial up connection between the two computer systems, a VAN connection, or an Internet connection.

Using a dial up connection, a modem associated with the first system could dial and establish a PSTN telephone line connection with a modem associated with the second system. An operator would be able to export the data file from the first system, transfer the data file to the second system over the PSTN connection, and an operator of the second system could load the data file into the second system.

A VAN connection is quite similar to a dial-up connection with the exception that the PSTN connection is continually maintained (e.g. a leased line) for security. Transfer of a data file between the first system and the second system over a VAN may include the operator of the first system exporting the data file, transferring the data file to the second computer system over the VAN, and an operator of the second system loading the data file into the second system.

Subsequent development of the Internet and secure file transfer systems such as the Secure File Transfer Protocol (SFTP) has made dial up connection and VAN technology obsolete for most data transfer application. Utilizing the Internet and SFTP technology, the operator of the first computer system would export the data file, log onto the SFTP server (that is networked to the second computer system), and upload the file to the SFTP server. The operator of the second computer system would then retrieve the file from the SFTP server and load the file into the second computer system.

While transferring of files using dial up connections, VAN connections, and FTP file transfer are a significant improvement over use of magnetic media for transferring data file, the two systems must still be compatible and human intervention is still required for the file transfer.

A separate field of technology known as web services is being developed to support platform independent processing calls over the Internet. Web Services are data processing services (referred to as methods) which are offered by a servicing application to a requesting application operating on a remote system.

The system offering the web services to requesting systems publishes a Web Service Description Language (WSDL) document which is an Extensible Markup Language (XML) document that describes the web service and is compliant with the Web Services Description Language (WSDL) protocol. The description of the web service may include the name of the web service, the tasks that it performs, the URL to which the method requests may be sent, and the XML structure and parameters required in a method request.

To obtain a published service, the requesting application sends a method call to the system as a Simple Object Access Protocol (SOAP) message within an HTTP wrapper. The SOAP message includes an XML method call which conforms to the required structure and parameters. So long as each system can build and interpret the XML data within the SOAP message within the HTTP wrapper, no compatibility between the two systems is required.

Web services enable applications to be written which request data from the web service providers. For example, a web server which provides stock quotes may publish the structure and parameters for requesting a stock quote, the method call may be required to include the ticker symbol corresponding to the requested quote. Such known web service systems are optimized for a web server system which provides information to a requesting application in response to receiving a method call for a method which the web service systems publishes as available.

Web service systems are optimized for unattended transfer of XML method calls and responses between a system and a web service provider. However, data transfer between a database system of a business and its third parties still is typically performed by exporting a transaction file, transferring the transaction file, and loading the transaction file at the second system—all steps that are facilitated by human intervention.

At the most general level, what is needed is a solution that enables unattended transfer of files over an open network, such as the Internet, between two unattended applications, each operating on remote and secure network systems. More specifically, what is needed is a solution that enables unattended transfer of files over an open network that does not

suffer the difficulties and complications that would be encountered if attempting to configure and operate known Internet FTP systems.

SUMMARY OF THE INVENTION

A first aspect of the present invention is to provide a transfer client system for exchanging files with a transfer server over an open network. The transfer client system comprises: i) an upload directory for storing files for subsequent transfer to the transfer server, ii) an authentication registry securely stores authentication credentials, and iii) a transfer client.

The transfer client periodically sends a log-on message to a remote transfer server over a secure transport protocol logical connection established over the open network. The log-on message includes the authentication credentials. In response, the transfer client receives a session ID from the remote transfer server.

The transfer client sends a read event message to the remote transfer server over a secure transport protocol logical connection established over the open network. The read event message includes the Session ID obtained from the remote transfer server.

In response, the transfer client receives event parameters associated with the event. The event parameters may be structured as XML tagged data. The event parameters include identification of a file name, identification of an upload directory path, and a file handling instruction indicating one of data processing by the remote transfer server and messaging to a second system. The parameters further include loading rules if the file handling instruction indicates data processing by the remote transfer server. The parameters further include a destination client ID if the file handling instruction indicates messaging to a second system.

The transfer client sends an upload message to the remote transfer server over a secure transport protocol logical connection established over the open network upon locating a file matching the file name in the upload directory. The upload message comprises the session ID and the binary contents of the file.

The transfer client further provides a file handling message to the remote transfer server over a secure transport protocol logical connection established over the open network.

The file handling message includes the loading rules and an instruction for calling a local process executed by the remote transfer server for loading data from the file into an application database in accordance with the loading rules if the file handling instruction indicates data processing by the remote transfer server.

The file handling message includes the destination client ID and an instruction for calling a local processes executed by the remote transfer server to write the destination client ID to a field of an ownership table whereby the second system may subsequently locate the record in the ownership table and retrieve the binary contents—if the file handling instruction indicates messaging to a second system.

For a better understanding of the present invention, together with other and further aspects thereof, reference is made to the following description, taken in conjunction with the accompanying drawings, and its scope will be pointed out in the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a block diagram of a system for secure and unattended file transfer in accordance with one embodiment of the present invention;

FIG. **2** is a flow chart representing exemplary operation of a configuration application in accordance with one embodiment of the present invention;

FIG. **3** is an exemplary User ID table in accordance with one embodiment of the present invention;

FIG. **4** is a flow chart representing exemplary operation of a configuration application in accordance with one embodiment of the present invention;

FIG. **5***a* is table representing an exemplary event key table in accordance with one embodiment of the present invention;

FIGS. **5***b*-**5***d* are tables representing an exemplary event parameter table in accordance with one embodiment of the present invention;

FIG. **6** is a table representing exemplary email codes in accordance with one embodiment of the present invention;

FIG. **7** is a diagram representing an exemplary available printers table in accordance with one embodiment of the present invention;

FIG. **8** is a table representing exemplary transfer methods operated by the transfer server in accordance with one embodiment of the present invention;

FIGS. **9** through **21** represent operation of an exemplary transfer method operated by the transfer server in accordance with one embodiment of the present invention;

FIG. **22** represents an ownership table in accordance with one embodiment of the present invention;

FIG. **23** represents an exemplary session ID monitoring process operated by the transfer server in accordance with one embodiment of the present invention;

FIG. **24** is a table representing exemplary local processes operated by the transfer client in accordance with one embodiment of the present invention;

FIG. **25** is a flow chart representing exemplary authentication function of a transfer client in accordance with one embodiment of the present invention;

FIG. **26** is a flow chart representing an exemplary download process in accordance with one embodiment of the present invention;

FIG. **27***a* is a flow chart representing an exemplary upload polling process in accordance with one embodiment of the present invention;

FIG. **27***b* is a flow chart representing an exemplary upload process in accordance with one embodiment of the present invention;

FIG. **28** is a table representing an audit table in accordance with one embodiment of the present invention;

FIGS. **29***a* and **29***b* represent exemplary operation of a back end server application in accordance with one embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The present invention is now described in detail with reference to the drawings. In the drawings, each element with a reference number is similar to other elements with the same reference number independent of any letter designation following the reference number. In the text, a reference number with a specific letter designation following the reference number refers to the specific element with the number and letter designation and a reference number without a specific letter designation refers to all elements with the same reference number independent of any letter designation following the reference number in the drawings.

It should also be appreciated that many of the elements discussed in this specification may be implemented in hardware circuit(s), a processor executing software code, or a combination of a hardware circuit and a processor executing

code. As such, the term circuit as used throughout this specification is intended to encompass a hardware circuit (whether discrete elements or an integrated circuit block), a processor executing code, or a combination of a hardware circuit and a processor executing code, or other combinations of the above known to those skilled in the art.

FIG. **1** illustrates exemplary architecture of a system for secure and unattended remote file transfer **10** (e.g. the remote file transfer system) over an open network such as the Internet **12** in accordance with one embodiment of the present invention. The remote file transfer system **10** comprises at least one host system **11** and at least one client system **13**—each of which is coupled to the Internet **12**.

Overview of Host System

The host system **11** comprises at least one web server **44**, a web services server **46**, a database **40**, and (optionally) a back end application server **38**. In the exemplary embodiment, the web server **44** and the web services server **46** are coupled to an IP compliant network typically referred to as a DMZ network **32**—which in turn is coupled to the Internet **12** by outer firewall systems **30** and coupled to an IP compliant local area network **36** by inner firewall systems **34**. The web server **44** and the web services server **46** may be operated on the same hardware server within the DMZ. The database **40** and the back end application server **38** may be coupled to the local area network **36**.

The web server **44** comprises a known web server front end **43** and a server application **45**. The server application **35** comprises a data processing services module **48** and a configuration module **47**.

The data processing services module **48** may be a menu driven application that, in combination with the web server front end **43**, provides sequences of web pages to a remote client system to enable an operator of the remote client system to exchange business process and/or financial transaction data between the operator's business and the business controlling the host system **11**. More specifically, the web pages provide data from application tables **319** of the database **40** and obtain data from the operator for writing to the application tables **319** in accordance with the business processes coded or configured into the data processing server module **48**.

For example, if the business controlling the host system **11** is a financial institution, the data processing server module **48** may provide web pages which enable the operator to obtain reports and implement transactions typically provided by systems known as "Treasury Work Stations". If the business controlling the host system **11** is a corporate entity providing goods or services, the data processing server module may provide web pages which enable the operator to post invoices, adjust invoices, post payments, request credit memos, and exchange other business process and financial data between the two entities accounting and/or resource management systems.

The configuration module **47** may be a menu driven application that, in combination with the web server front end **43**, provides sequences of web pages to a remote client system to enable an operator of the remote client system to configure remote transfer of files between the web services server **46** and a transfer client workstation **22** of the client system **13**. A more detailed discussion of the configuration module **47** and its operation is included herein.

The web services server **46** may comprise a web services front end **58** and a transfer server **60**.

The web services front end **58** may be a known web services front end which utilizes the simple object access protocol (SOAP) for exchanging XML messages with remote systems (and in particular a transfer client **24** operating on the transfer client workstation **22**) using secure socket connections (e.g. SSL Connections) over the Internet **12**.

The transfer server **60** may, in combination with the web services front end **58**, publish a WSDL document describing the data processing services (e.g. transfer methods **51**) provided by the transfer server **60** and, upon receiving a method call from a remote system, execute the applicable transfer method **51** and thereby provide the data processing service to the remote system making the method call.

The transfer methods **51** (which will be discussed in more detail with reference to FIG. **8**) in the aggregate enable a remote unattended system making method calls to the web services server **46** to: i) perform functions similar to those performed by an operator of a remote browser systems using the application server module **45** of the web server **44**; and ii) exchange files (or messages) with the back end application server **38**.

More specifically with respect to performing functions similar to those performed by an operator of a browser system using the application server module, the transfer methods **51** enable a remote system to: i) upload files to the web services server **46** and invoke automated handling of the file by a data processing module **55** of the transfer server **60**—which writes data from the uploaded file to the application tables **319**; and ii) invoke reading of data from the application tables **319** and creation of a file by the data processing module **55** for downloading to the remote system by the web services server **46**.

More specifically, with respect to exchanging files with the back end application server **38**, the transfer methods **51** enable a remote system to: i) upload files to the transfer server **60** for storage as binary objects within object storage records **317** of the database **40**—for subsequent retrieval by the applicable back end application server **38**; and ii) download files or messages from the object storage records **317** which were previously provided to the web services server **46** by a back end application server **38**.

Overview of Client System

The client system **13** comprises at least one business process application server **18**, an administrator workstation **26**, and a transfer client workstation **22** communicatively coupled by an IP compliant local area network **16**. The local area network **16** may be coupled to the Internet **12** by firewall systems **14**.

The business process application server **18** may operate a known database system or enterprise resource management (ERP) system for recording business process and financial transactions in a database (not shown). Further, the business process application server **18** may be configured (by a user of an administrator workstation) for unattended exchange of files between the business process application server **18** and the host system **11**. More specifically the business process application server **18** is configured to: i) write data files which are intended for transfer to the web services server **46** of the host system **11** to a predetermined upload directory **50***a*; and ii) retrieve data files expected from the web services server **46** from a predetermined download directory **50***b*. As will be discussed herein, each of the upload directory **50***a* and the download directory **50***b* are either local or remote drives accessible to the business process application server **18** and the transfer client workstation **22**.

The administrator workstation **26** may be a known networked computer system with a known operating system (not shown), IP networking hardware and software (not shown), and a known browser system **28** for establishing a TCP/IP

connection with a remote web server and enabling the browser **28** to navigate web pages provided by the remote web server.

The administrator workstation **26** is useful for establishing a connection with the web server **44** of the host system **11** for: i) navigating web pages provided by the data processing server module **48** for reading and writing data to the application tables **319** within the database **40** of the host system **11**; and ii) navigating web pages provided by the configuration module **47** for configuring the systems for unattended remote file transfer.

The transfer client workstation **22** may also be a known networked computer system with an operating system **75** and IP networking hardware and software (not shown). The workstation **22** also includes a transfer client application **24**.

The operating system **75** may manage a known directory system **74** and a known authentication registry **77**. For purposes of illustrating the present invention, the directory system **74** comprises the upload directory **50***a* and the download directory **50***b*. As discussed, each of the upload directory **50***a* and the download directory **50***b* may be local or network drives available to each of the transfer client workstation **22** and the business process application servers **18**.

For purposes of illustrating the present invention, the authentication registry **77** stores authentication credentials **70** used by the transfer client **24** for authenticating itself to the web services server **46**. The authentication credentials **70** comprise a group ID value **71**, a user ID value **72**, and a Password **73**. The authentication credentials are stored in an encrypted format.

In operation, the transfer client **24** periodically makes processing calls to the transfer methods **51** of the web services server **46** using SOAP messaging over secure TCP/IP channels. In aggregate, the processing calls provide for the transfer client **24** to authenticate itself to the web services server **46** utilizing the authentication credentials **70** as stored in the authentication registry **77** and obtain a Session ID from the web services server **46** for use with subsequent processing calls to the transfer methods **51**. The subsequent processing calls enable the transfer client **24** to: i) provide the web services server **46** with a list of printers which are available to the transfer client workstation (so that an administer may configure downloaded files for automated printing); ii) obtain parameters for upload events and download events scheduled for the transfer client **24**; and iii) execute each of such scheduled upload events and download events.

In general, execution of an upload event comprises transferring a file found in the upload directory **50***a* by: i) encapsulating the file, as a binary large object (e.g. BLOB), within an XML data processing call; ii) transferring the data processing call to the web services server **46** within a Simple Object Access Protocol (SOAP) message wrapper using an SSL channel; iii) generating a subsequent data processing call instructing the web services server **46** to invoke an applicable process within the data processing module **55** for handling the file if the file is to be loaded into the application tables **319** by the web services server **46**; iv) providing destination ownership information to the web services server **46** if the file is to be subsequently retrieved by the back end application server **38**; v) and moving the uploaded file from the upload directory **50***a* to a processed files directory **52** to eliminate overwriting the file or transferring the same file to the web services server **46** a second time. A more detailed description of execution of an upload event and the interaction between the transfer client **24** and the web services server **46** is included herein.

In general, execution of a download event comprises: i) generating a data processing call instructing the web services server **46** to invoke an applicable process within the data processing module **55** for extracting data from the application tables **319** and creating a file for download (if applicable); ii) generating data processing call(s) to web services server **46** to check if a file with applicable ownership information is available for download (whether newly created by the data processing module **55** or previously provide to the web services server **46** by the back end application server **38**); iii) generating data processing call(s) to the web services server **46** to obtain the file as a BLOB through the SSL channel; and iv) saving the downloaded file in the download directory **50***b* for subsequent retrieval by the business process application server **18**. A more detailed description of execution of a download event and the interaction between the transfer client **24** and the web services server **46** is included herein.

Configuration Module

As discussed, the configuration module **47** enables an operator of a remote system (such as an operator of the browser **28** of the administrator workstation **26**) to entitle and configure a transfer client **24** for unattended file transfer with the web services server **46**.

More specifically, the configuration module **47** establishes a secure TCP/IP connection with the browser **28** (upon initiation by the browser **28**) and provides a menu driven sequence of web pages for: i) entitling a transfer client **24** (for download and installation on the transfer client workstation **22**); ii) configuring the periodic connection (polling parameters) between the transfer client **24** and the web services server **46**; and iii) configuring the upload events and download events which the transfer client **24** will perform.

Entitling Transfer Client and Installation

Turning to the flow chart of FIG. **2**, exemplary steps performed by the configuration module **47** for entitling a transfer client and initially loading the transfer client **24** on a transfer client workstation **22** are shown.

After a TCP/IP connection has been established between the administrator workstation **26** and the server application **45** and after the administrator has been appropriately authenticated, the administrator may select a menu choice to entitle a transfer client. Step **236** represents the administrator selecting to entitle a transfer client.

Step **238** then represents the configuration module **47** obtaining initial configuration and authentication credentials **70** for the transfer client. The authentication credentials **70** include a user group ID value **71**, a user ID value **72**, and a password value **73**. These may be obtained from the administrator or generated by the module **47**. Step **240** represents writing the initial authentication credentials **70** to a user ID table **314** within the database **40**.

Turning briefly to FIG. **3**, an exemplary user ID table **314** is shown. The user ID table **314** includes a plurality of records **352**, each identified by a unique index **360** and each of which includes the authentication credentials **70** of a transfer client **24** configured for periodic file transfer with the web services server **46**. Each record comprises a transfer client ID **362** which may comprise a separate user group ID field **354** and a user ID field **356** for storing the user group ID value **71** and user ID value **72** assigned to the transfer client **24** respectively. Additional fields include: i) a password field **358** for storing the then current password value **73** (in encrypted form) assigned to the transfer client **24**, ii) an interval field **364** for storing a time period which defines a time interval at which the transfer client will make a sequence of processing calls to the web services server **46** to perform various actions which include authenticating itself and obtaining a new session ID, iii) a session time field **366** which stores a time stamp

representing the most recent time at which the transfer client made such sequence of processing calls to the web services server **46** to obtain a new session ID; iv) an alert instruction field **367** which identifies an email address or other notification address to which notification is to be sent in the event that a transfer client **24** fails to make the sequence of processing calls to the web services server **46** to obtain a new session ID **83** within a timely manner (e.g within the period of time stored in the intervals field **364** following the time stamp **93** stored in the session time field **366**, v) a session ID field **368** storing the most recent session ID **83** assigned to the transfer client **24**; and vi) a status field **369** storing a "true" value if the transfer client **24** had been properly configured and authorized and storing a "false" value prior to authorization or if a logon attempt has been made with an incorrect password. If the status field **369** is set "false", the web services server **46** may deny access to the workstation **22** as will be discussed in more detail with respect to FIG. **9**.

It should be appreciated that in the exemplary embodiment, the group ID value **71**, user ID value **72**, and password value **73** are initially written to the user ID table **314** at step **240** and the remaining fields are written during configuration or operation as discussed herein.

Returning to FIG. **2**, after writing the group ID value **71**, user ID value **72**, and password value **73** to a record **352** of the user ID table **314**, the TCP/IP connection with the administrator workstation **26** may be torn down and step **242** represents establishing a secure TCP/IP connection with the transfer client workstation **22**. More specifically, to download the transfer client **24** to the workstation **22**, the administrator utilizes a browser of the client workstation **22** (not shown) to establish the secure TCP/IP connection to the server application **45**. It should be appreciated that when establishing the connection from the workstation **22**, the administrator authenticates the workstation using the authentication credentials **70** provided at step **238**. After the TCP/IP connection is established, and the workstation/administrator authenticated, the transfer client **24** can be downloaded to the workstation **22** for installation by the operator. Step **244** represents the server application providing the code for the transfer client **24** to the workstation **22**.

In the exemplary embodiment, the code for the transfer client **24** may be executable code or interpretable code conforming with Active X Protocols or virtual machine protocols such that the transfer client **24** self installs at step **244**. In the exemplary embodiment, installation includes writing the authentication credentials **70** to the authentication registry **77** so that the transfer client **24** may begin its periodic authentication to the web services server **46** and execute the applicable upload, download, and gateway events.

Configuration

In addition to entitling and installing the transfer client **24** in accordance with the steps of FIG. **2**, the administrator also utilizes the browser **28** of the administrator workstation **26** to configure operation of the transfer client **24**—which includes configuring authentication parameters and file transfer parameters—including upload event parameters, download event parameters, and gateway event parameters.

The flow chart of FIG. **4** represents exemplary steps of configuring such parameters. It should be appreciated that these configuration steps may be performed initially upon entitling the client **24** and may be updated at times thereafter when appropriate.

To initiate configuration, the administrator establishes a secure TCP/IP connection with the server application **45** and selects an applicable menu choice for configuration. Step **246** represents receiving administrator selection of the menu choice to configure a transfer client **24**.

Step **248** represents obtaining the periodic authentication parameters for the transfer client **24** and writing such authentication parameters to the user ID table **314** (FIG. **3**) in the database **40**. More specifically, step **248** represents providing web pages to the administrator workstation **26** to enable the administrator to provide a time interval value **78** (typically one minute) for storage in the interval field **364** of the user ID table **314** and provide a notification address **79** for writing to the alert instruction field **367**.

Returning to FIG. **4**, step **250** represents configuring file transfer parameters within event tables **310** of the database **40**. In the exemplary embodiment, the transfer client **24** obtains all if its instructions and parameters related to each upload event, download event, and gateway event from the web services server **46**. More specifically, the administrator configures event parameters for each event within the event tables **310** of the database **40** using the configuration module **47** of the web server **44**. The transfer client **24** retrieves such event parameters during the course of periodically authenticating itself to the web services server **46**.

Turning briefly to FIGS. **5***a* and **5***b*, exemplary event tables **310** include an event key table **311** (FIG. **5***a*) and an event parameter table **316** (FIG. **5***b*).

The event key table **311** includes a plurality of records **313**. Each record **313** associates an event with the transfer client **24** that is to execute the event. The transfer client **24** is identified by its group ID value **71** (stored in a group ID field **354**) and its user ID value **72** (stored in a user ID field **356**). The event is identified by an event key value **80** stored in an event key field **315**. Each upload event and download event that a transfer client **24** is configured to perform is identified by an event key value **80** and is associated with the transfer client **24** in the event key table **311**.

The event parameter table **316** includes a plurality of records **320**. Each record includes an event key field **315**, a parameter ID field **321**, and a parameter value field **322**. Each event parameter value is stored in a separate record **320** in the event parameter table **316** and is identified by an event parameter ID stored in the event parameter ID filed **321**. Both the parameter ID field **321** and the parameter value field **322** are text fields such that the information stored therein can be assembled as an XML file for providing to a transfer client **24** (Step **170** of FIG. **25** discussed herein). The event to which the parameter associates is identified by its event key value **80** stored in the event key field **315**.

Turning briefly to FIG. **5***c*, exemplary event parameters which may be associated with an upload event include: i) a file name **323** identifying the name of the file to be uploaded; ii) an upload directory path **324** identifying the upload directory in which the file is to be located; iii) a BLOB handling field **326** identifying whether the file, after uploading is to be left as a "message" for retrieval by another system or loaded by the web services server **46** into the application tables **319**; iv) a destination group ID value **325** identifying a destination group to receive the file after transfer to the web services server—if the file is to be left as a "message" for retrieval by another system identified by the destination group value; v) BLOB loading rules **327** identifying a local data processing function and parameters for calling such local data processing function for loading the file into the application table **319** if handling by the web services server is applicable; vi) a status parameter **328** identifying the then current status of the event (such as whether the event has started, the time started, the event is completed, the time completed, the event was aborted, or the time aborted); vii) an email address **101** iden-

tifying an address to which a notification email is to be sent; iv) an email code **102** identifying conditions for sending the email notification;

Turning briefly to FIG. **6**, exemplary email codes **102**, as stored as records in an email codes table **102**, include an email code **01** for no email notification (in which case the email address field **101** may be blank), an email code **02** for sending a notification email upon successful completion of the event; an email code **03** for sending an email upon failure to successfully complete the event; and an email code **04** for sending an email upon either success completion of, or failure to successfully complete, the event.

Turning briefly to FIG. **5***d*, exemplary event parameters which may be associated with a download event include: i) a file name **342** which identifies the name of the file to be downloaded; ii) a download directory path parameter **343** which identifies the download directory **50***b* to which the file is to be written, iii) a BLOB generation parameter **345** which identifies whether the BLOB is to be generated by the data processing module **55** of the web services server **46** by reading data from the application table **319** (e.g. a data processing down load event) or whether the BLOB is a file previously provided to the web services server **46** by another system (e.g. a messaging event); iv) a profile ID **347** and extract rules **349** which are instructions for generating the BLOB based on data from the application tables **319** if the event is a data processing download event; v) a class **351** and offset **353** for identifying the BLOB in the ownership tables **62**; vi) a status parameter **355** identifying the then current status of the event (such as whether the event has started, the time started, the event is completed, the time completed, the event was aborted, or the time aborted); vii) an email address **101** identifying an address to which a notification email is to be sent; viii) an email code identifying conditions for sending the email notification; ix) a printer field **359**; and x) a print code field **357**. The print code field **357** stores and indication of whether a file should automatically be sent to a printer upon download. The printer field **359** identifies the specific printer to which the file should be sent.

Turning briefly to FIG. **7**, the available printers table **318** includes a plurality of records **374**. Each record associates a printer (identified by its printer ID value **81** in a printer ID field **378**) with the group ID value **71** and user ID value **72** of a transfer client **24**. As will be discussed, each transfer client **24** periodically updates the available printers table **318** such that an administrator may configure download events in a manner that provides for the transfer client **24** to automatically send to the downloaded filed to an available printer.

Web Services Server

As discussed, the web services server **46** may comprise a web services module **58** and a transfer server **60**. The web services module **58** may be a known web services front end which utilizes the simple object access protocol (SOAP) for exchanging XML messages with remote systems (and in particular the transfer client **24** of the transfer client workstation **22**) using SSL channels over the Internet **12**.

The transfer server **60** may, in combination with the web services module **58** publish a WSDL document describing the transfer methods **51**—and, upon being called by a transfer client **24**, execute such methods. Turning briefly to FIG. **8**, an exemplary listing of the transfer methods **51** which are performed by the transfer server **60** are shown. These methods, in the aggregate, provide for the automated file transfer systems as discussed above. The steps executed to perform each transfer method **51** is discussed with respect to one of the flow charts of FIGS. **9** through **21** respectively and operation of the transfer client **24** in calling such methods to perform the file transfers is discussed later herein.

Check Status Method

The flow chart of FIG. **9** represents a transfer method **51** called Check Status which is executed by the web services server **46** in response to receiving a check status method call from a transfer client **24**. Step **400** represents receipt of the parameters of the method call which include a user group ID value **71** and a user ID value **72** assigned to the transfer client (during configuration discussed later herein).

Step **402** represents retrieving the record **352** from the User ID table **314** which corresponds to the group ID value **71** and the user ID value **72** and step **404** represents returning the "True" or "False" value of the status field **369** of the record **352**.

As will be discussed in more detail herein, if the value of the status field **369** is false, the transfer client **24** either has not been authorized or has attempted to authenticate with an incorrect password. In either case, the transfer client **24** is not permitted to interact with the web services server **46** until such time as the value of the status field **369** has been returned to true.

Log-On Method

The flow chart of FIG. **10** represents a transfer method **51** called Log-On which is executed by the web services server **46** in response to receiving a Log-On method call from a transfer client **24**. Step **410** represents receipt of the parameters of the method call which include the group ID value **71**, the user ID value **72**, and the then current password value **73**.

Step **412** represents retrieving the encrypted password value **82** from the record **352** of the user ID table **314** which corresponds to the group ID value **71** and the user ID value **72**.

Step **414** represents decrypting the encrypted password value **82**. In the exemplary embodiment, the encrypted password value **82** is generated using a one way ciphering technique wherein the password value itself is the key for deciphering the encrypted password value **82**. As such, when a password value **73** is provided by the transfer client **24**, it may be used as a key for deciphering the encrypted password value **82**. If the password value **73** matches the deciphered value, then the password provided by the transfer client **24** matches the original password which was encrypted into the encrypted password value **82** and stored in the user ID table **314**.

Step **416** represents determining whether the password value **73** provided by the transfer client **24** matches the result of deciphering the encrypted password value **82**. If there is a match, a Session ID **83** is generated at step **418**.

Step **419** represents writing the Session ID **83** to the Session ID field **368** of the user ID table **314** and writing a time stamp (representing the time the Session ID was generated) to the Session Time field **366** of the user ID table **314**. Step **420** represents returning the Session ID **83** to the transfer client **24**.

Alternatively, if the password value **73** provided by the transfer client **24** does not match the result of deciphering the encrypted password **82** at decision box **416**, the status field **369** of the record **352** is set to "False" at step **422** and notification is sent to the notification address **79** as stored in the alert instruction field **367** of the record **352** at step **424**. In the exemplary embodiment, the notification address **79** will be an email address to which certain information about the failure is sent. The information may include the group ID value **71** and the user ID value **72**.

Get Password Method

The flow chart of FIG. **11** represents a transfer method **51** called Get Password which is executed by the web services server **46** in response to receiving a Get Password method call from a transfer client **24**. Step **430** represents receipt of the parameters of the method call which include the Session ID **83**.

Step **432** represents generating a random password value **73**. At step **434** the password value **73** is encrypted to generate an encrypted password value **82** and saving the encrypted password value **82** in the password field **358** of the record **352** in the User ID table **314** which corresponds to the Session ID **83**.

Step **436** represents returning the randomly generated password **73** to the transfer client **24**.

Send Printers Method

The flow chart of FIG. **12** represents a transfer method **51** called Send Printers which is executed by the web services server **46** in response to receiving a Send Printers method call from a transfer client **24**. Step **440** represents receipt of the parameters of the method call which include the Session ID **83** and the Printer ID value **81** of each printer available to the transfer client workstation **22**.

Step **442** represents updating the records **374** of the available printers table **318** to reflect printers then currently available to the transfer client workstation **22**.

Retrieve Active Event Keys Method

The flow chart of FIG. **13** represents a transfer method **51** called Retrieve Active Event Keys which is executed by the web services server **46** in response to receiving a Retrieve Active Events Keys method call from a transfer client **24**. Step **450** represents receipt of the parameters of the method call which include the Session ID **83**.

Step **451** represents retrieving the group ID value **71** and the user ID value **72** associated with the Session ID **83** from the User ID table **314**.

Step **452** represents retrieving each Event Key value **80** associated with the group ID value **71** and the user ID value **72** in the event key table **311** (FIG. **5***a*).

Step **454** represents returning each retrieved event key value **80** to the transfer client **24**.

Read Event Method

The flow chart of FIG. **14** represents a transfer method **51** called Read Event method which is executed by the web services server **46** in response to receiving a Read Event method call from a transfer client **24**. Step **460** represents receipt of the parameters of the method call which include the Session ID **83** and an Event Key value **80**.

Step **462** represents retrieving the event parameters (e.g. each parameter ID and its associated parameter value) associated with the Event Key value **80** on the event parameter table **316** (FIG. **5***b*, **5***c*, **5***d*). The event parameters may comprise identification of a file **342** and rules for creating a binary object **349**.

Step **464** represents returning the event parameters to the transfer client **24**.

Update Event Method

The flow chart of FIG. **15** represents a transfer method **51** called Update Event which is executed by the web services server **46** in response to receiving an Update Event method call from a transfer client **24**. Step **470** represents receipt of the parameters of the method call which include the Session ID **83**, an Event Key value **80**, Status Information, and an Offset Value. In the exemplary embodiment, the status information may be identification of a parameter ID **321** and a parameter value **322** for storage in the event parameter table **316**. It is useful for the transfer client **24** to be able to update parameter values during execution of an event to reflect the processes performed. The offset value is a value representing an increment such that the number of time that an event has been processed can be tracked. This is useful for avoiding duplicate upload events, download events, or gateway events for the same file.

Step **472** represents updating the event parameter table **316** as applicable to reflect the status information provided in the Update Event method call.

Step **474** represents updating the offset value as stored in the event parameter table **316** to reflect the Offset Value provided in the Update Event method call.

Create BLOB Method

The flow chart of FIG. **16** represents a transfer method **51** called Create BLOB method which is executed by the web services server **46** in response to receiving a Create BLOB method call from a transfer client **24**. Step **480** represents receipt of the parameters of the method call which include the Session ID **83**, a Profile ID **347**, and extract rules **349**.

Step **482** represents invoking a local function (e.g. a function executed by the data processing module **55** of the transfer server **60**) which corresponds to the to the profile ID **347** to retrieve applicable data from the application tables **319** and providing the extract rules **349** to a file building system which formats the retrieved data in a file format compatible with (e.g. for loading into) the business process application server **18**. For example, in a balance and transaction reporting system, the profile ID **347** may indicate a data processing method and a group of parameters which result in the data proceeding module retrieving today's balance values for a certain group of accounts from the application tables **319**. The extract rules **349** may identify to the file building system that the balances and associated data retrieved from the application tables should be formatted as a particular type of EDI file recognizable by the business process application server **18**.

Step **484** represent obtaining the BLOB from the data processing module **55** and step **486** represents writing the BLOB to the object storage **317**.

Step **488** represents creating an ownership record **63** in an ownership table **62** and populating each of the fields for which a value is available.

Step **489** represents returning a class value to the transfer client **24** making the processing call to the web services server.

Turning briefly to FIG. **22**, an exemplary ownership table **62** is shown. The ownership table **62** comprises a plurality of records, each of which is associated with a BLOB stored in the object storage **317**.

The fields of the ownership table **62** comprise a BLOB ID field **85**, a class field **86**, a destination group ID field **87**, and an offset field **88**. The BLOB ID field **85** stores a BLOB ID value **89** which identifies a particular BLOB stored in the object storage **317**. The class field **86** stores a class value **90** which identifies the type of data within the BLOB which, in the exemplary embodiment may be a file name extension. The destination group ID field **87** stores a destination group ID value **91** which identifies the group ID value of another transfer client **24** of a remote system or the back end application server **38** which may retrieve the BLOB. The offset field **88** stores an offset value **92** which is an increment value assigned to the BLOB and is useful for preventing duplicate downloading of the same BLOB.

Check For Available BLOB (CFAB) Method

The flow chart of FIG. **17** represents a transfer method **51** called CFAB method which is executed by the web services server **46** in response to receiving a CFAB method call from a transfer client **24**.

Step **490** represents receipt of the parameters of the method call which include the Session ID **83**, a Class value **90**, and an Offset Value **92**.

Step **492** represents comparing ownership parameters to values within the ownership table **62** to determine whether a BLOB exists for downloading. More specifically, i) the class value **90** provided in the method call is compared to the class value **90** of each record **63** of the ownership table **62** to determine if a BLOB with a class value matching the class value provided in the method call exists; and ii) the group ID value **71** (which associates with the session ID value **83** in the user ID table **314**) is compared to the destination group ID value **91** of each record **63** of the ownership table **62** to determine if a BLOB with a destination group ID value **91** matching the group ID value **71** of the transfer client **24** exists.

In either case, the offset value **92** provided in the method call is compared to the offset value **92** in the ownership table **62**. An offset value **92** in the ownership table **62** that is higher than the offset value **92** provided in the method call indicates that the BLOB has not yet been downloaded and therefore exists for downloading.

If a BLOB exists for downloading as determined at decision box **494**, the BLOB ID **89** from the record **63** is returned to the transfer client **24** at step **498**. If no BLOB meeting the ownership requirements exists, a "NO BLOB" confirmation is returned to the transfer client **24** at step **496**.

Download BLOB Method

The flow chart of FIG. **18** represents a transfer method **51** called Download BLOB method which is executed by the web services server **46** in response to receiving a Download BLOB method call from a transfer client **24**.

Step **500** represents receipt of the parameters of the method call which include the Session ID **83** and a BLOB ID **89**.

Step **502** represents retrieving the BLOB corresponding to the BLOB ID **89** from the object storage **317** and providing the contents of the BLOB to the transfer client **24**.

Upload File Method

The flow chart of FIG. **19** represents a transfer method **51** called Upload BLOB method which is executed by the web services server **46** in response to receiving an Upload BLOB method call from a transfer client **24**.

Step **510** represents receipt of the parameters of the method call which include the Session ID **83**, a file name, and the contents of the BLOB.

Step **512** represents writing the BLOB to the object storage **317** and step **514** represents creating and populating an ownership record **63** in the ownership table **62**.

Step **516** represents returning the BLOB ID to the transfer client **24** making the processing call to the web services server **46**.

Set Destination BLOB Owner Method

The flow chart of FIG. **20** represents a transfer method **51** called Set Destination BLOB Owner method which is executed by the web services server **46** in response to receiving a Set Destination BLOB Owner method call from a transfer client **24**.

Step **520** represents receipt of the parameters of the method call which include the Session ID **83**, a BLOB ID **89**, and destination user group **91**.

Step **522** represents writing modifying the ownership record **63** associated with the BLOB ID **89** in the ownership table **62** by writing the destination user group ID **91** provided in the method call to the destination group ID field **87** of the record **63**.

Process BLOB Method

The flow chart of FIG. **21** represents a transfer method **51** called Process BLOB method which is executed by the web services server **46** in response to receiving a Process BLOB method call from a transfer client **24**.

Step **530** represents receipt of the parameters of the method call which include the Session ID **83**, a BLOB ID, a Profile ID, and Loading Rules.

Step **532** represents invoking an application function of the data processing module **55** for loading the contents of the BLOB into the application tables **319** in accordance with the loading rules. Both identification of the application function and the loading rules are as set forth in the event parameter table **316** and are provided by the transfer client **24** as part of the method call.

Web Services Server Monitoring of Polling

In addition to providing the methods discussed with respect to FIGS. **9** through **21**, the transfer server **60** also includes a session ID monitoring process **53** for monitoring the polling of each transfer server **60** and, if a transfer server fails to periodically contact the web services server **46** to update its password and events, the web services server **46** can generate a failure to poll alert.

Referring to FIG. **23**, the session ID monitoring process **53** monitors the session time field **366** and the interval field **364** of each record **352** of the User ID table **314**. Such monitoring is represented by step **231**. In the event that the current time exceeds the time stamp **93** stored in the session time field **366** by more than the time interval **78** stored in the interval field **364**, the transfer client **24** (identified by group ID **71** and user ID **72** of the record **352**) has failed to authenticate itself and obtain a Session ID (in accordance with the flowchart of FIG. **25** as will be discussed later herein) within the proper interval time. Determining that such failure exists is represented by decision box **233**.

In response to such failure, the web services server **46** will generate an alert email to the notification address **79** as stored in the alert instruction field **367** at step **235**.

Transfer Client

Returning to FIG. **1**, as discussed the transfer client workstation **22** may also be a known networked computer system with an operating system **75**, IP networking hardware and software (not shown), and the transfer client application **24**.

The operating system **75** may manage the directory system **74** and the authentication registry **77**. In the exemplary embodiment, the operating system may be one of the operating systems available from Microsoft® under its Windows® trade name or another suitable operating system providing the structures and functions useful for implementing the present invention.

The transfer client **24** includes authentication function **25** and, when applicable event parameters are obtained from the web services server **46**, includes spawned upload processes **27**, spawned download processes **29**, and spawned gateway processes **31**.

In general, the authentication function **25** is periodically performed by the transfer client **24** to authenticate itself to the web services server **46**, update its password value **73**, obtain a session ID **83**, update the available printers table **318**, and obtain event parameters for upload, download, and gateway

events. Each of the spawned processes **27**, **29**, and **31** is built by the transfer client **24** utilizing event parameters received from the web services server **46** for the purpose of executing the event. Each of the authentication function **25** and the spawned processes **27**, **29**, and **31** make calls to local processes **23** which are shown, in conjunction with the required process parameters, in the table of FIG. **24**.

Authentication Function

The flow chart of FIG. **25** represents exemplary operation of the authentication function **25** of the transfer client application **24**. The authentication function **25** initially runs upon loading of the transfer client **24** onto the workstation **22** and periodically thereafter as defined by the interval time value **78** stored in the user ID table **314**.

Step **152** represents the transfer client application **24** executing a local process **23** called Check Status at step **152**. Check Status makes a method call to a transfer method **51** operated by the web services server **46**. The transfer method **51** is also called "Check Status". The method call is formatted as an XML message and transferred to the web services server **46** within a SOAP message wrapper over an SSL channel.

The local function provides each of the group ID value **71** and the user ID value **72** (from the authentication registry **77**) to the web services server **46** as part of the method call. In response, the web services server **46** executes the Check Status Method as discussed with respect to FIG. **9** which includes looking up the record **352** corresponding to the group ID value **71** and user ID value **72** in the user ID table **314** to determine if the transfer client **24** is active. The "True" or "False" value in the status field **369** of the record **352** is returned to the transfer client.

If the status value is "False", at decision box **154**, the transfer client **24** waits the applicable time interval **78** before again making the Check Status Method call to the web services server **46** at step **152**.

If the status value is "True", at decision box **154**, the transfer client **24** executes a local process **23** called Session ID at step **156**. Session ID makes a method call to a transfer method **51** operated by the web services server **46**. The transfer method **51** is also called "Session ID". The local process **23** provides each of the group ID value **71**, the user ID value **72**, and the password value **73** (from the authentication registry **77**) to the web service server **46** as part of the method call. In response web services server executes its Session ID Method as discussed with respect to FIG. **10** and returns a Session ID **83** if the transfer client **24** is properly authenticated.

If a Session ID **83** is not obtained, as determined by decision box **158**, the transfer client **24** again waits the applicable time interval **78** before again making the Check Status Method call to the web services server **46** at step **152**.

If a Session ID **83** is obtained, the transfer client **24** executes a local process **23** called Get Password at step **160**. Get Password makes a method call to a transfer method **51** operated by the web services server **46**. The transfer method **51** is also called "Get Password". The local process provides the Session ID **83** as a parameter of the Get Password method call. In response web services **46** executes a Get Password method as discussed with respect to FIG. **11** and returns a randomly generated password **73** to the transfer client **24**.

In response to receiving the randomly generated password **73**, the transfer client **24** executes a local function called Save Password at step **162** to save the randomly generated password **73**, in encrypted form, in the authentication registry **77**

Step **164** represents the transfer client **24** executing a local process **23** called Send Printers. Send Printers makes a method call to a transfer method **51** operated by the web services server **46**. The transfer method **51** is also called Send Printers. The local process provides the Session ID **83** as well as the printer ID value **81** of each printer accessible to the transfer client workstation **22** as parameter of the Send Printer method call. In response the web services server **46** executes its Send Printers method as discussed with respect to FIG. **12** for updating the available printers table **318**.

Step **166** represents the transfer client **24** executing a local process **23** called Retrieve Active Event Keys. The local process makes a method call to a transfer method **51** operated by the web services server **46**. The transfer method **51** is also called Retrieve Active Event Keys. The local process provides the Session ID **83** as the parameter of the Retrieve Active Event Keys method call. In response, the web services server **46** executes the Retrieve Active Event Keys Method as discussed with respect to FIG. **13** and returns the event key value **80** for each event in the event key table **311** associated with the transfer client **24**.

If no event key values **80** are returned, as determined at decision box **168**, the transfer client **24** waits the time interval **78** before again sending a Check Status method call at step **150**. If at least one Event Key value **80** is returned, each event is performed in sequence.

Step **170** represents executing a local process **23** called Read Event. Read Event make a method call to a transfer method **51** operated by the web services server **46**. The transfer method **51** is also called Read Event. The local function provides the Session ID **83** and the event key value **80** as parameters of the method call. In response, the web services server **46** executes its Read Event method as discussed with respect to FIG. **14** and returns all of the parameters associated with the event key value **80** in the event parameter table **316**. The values are returned as an XML file with the parameter ID **321** being the XML tag and the parameter value **322** being associated with the tag.

Decision box **172** represents determining whether the event associated with the Event Key value **80** is eligible to run. For example, parameters of the event parameter table **316** may identify certain time periods or certain frequencies that events may be ran. If the event is outside of such time period or frequency parameters, the event is considered ineligible to run. If not eligible, the next event key value **80** is selected and the local process **23** Read Event is executed for such next event key value **80** at step **170**.

Step **174** represents executing a local process **23** called Update Event. Update Event makes a method call to a transfer method **51** operated by the web services server **46**. The transfer method **51** is also called Update Event. The local function provides the Session ID **83**, event key value **80**, status information (such as the time the event was started, the time the event was completed, or the time the event was aborted) and an offset value as parameters of the method call. The purpose of this Update Event processing call is to update applicable fields in the event parameter table **316** to indicate the then current status of the event. In response, the web services server **46** will execute its Update Event Method as discussed with respect to FIG. **15** for purposes of updating the applicable status records of the event parameters table **316**.

The event associated with the event key value **80** may be any of a download event, an upload event, or a gateway event. The type of event is identified by a parameter value returned at step **170**. Step **176** represents determining whether the event is an upload event or a download event. If the event is an upload event, an upload polling process **27** is spawned at step **177**. If the event is a download event, a download process **29** is spawned at step **178**.

Spawning Download Process

The flow chart of FIG. **26** represents exemplary operation of a spawned download process **29**.

Step **180** represents determining the type of the download event. The download event may be either a message event or a data processing event. The type of event is identified by the event type parameter **344** from the event parameter table **316** and received at step **170**.

If the event is a message event, the transfer client **24** executes a local process **23** called Check For Available BLOB. The local function makes a method call to a transfer method **51** operated by the web services server **46**. The transfer method **51** is also called Check For Available BLOB. The local process provides the Session ID **83**, a class value **90**, and offset value **92** as parameters of the method call. In response, the web services server **46** executes its Check For Available BLOB method as discussed with respect to FIG. **17** and returns a BLOB ID **89** if a BLOB meeting the criteria is available and not yet downloaded.

If no BLOB is available, as determined at decision box **184**, the transfer client **24** again executes the local process **23** called Update Event at step **186**—for the purpose writing an indication that the event is complete to applicable records of the event parameter table **316**.

Following execution of Update Event, the transfer client again returns to step **170** where the function Read Event is executed for the next Event Key value **80** provided by the web services server **46**.

If a BLOB is available at decision box **184**, the transfer client **24** executes a local process **23** called Download BLOB. The local process **23** makes a method call to a transfer method **51** operated by the web services server **46**. The transfer method **51** is also called Download BLOB. The local function provides the Session ID **83** and BLOB ID **89** as parameters of the method call. In response, the web services server **46** executes its Download BLOB Method as discussed with respect to FIG. **18** and returns the contents of the BLOB associated with the BLOB ID **89**.

Step **200** represents the transfer client **24** executing a local process **23** called Create And Write File. Create And Write File stores the BLOB using the file name parameter **342** in the in the download directory **50***b* identified by the download directory path parameter **343**—both associated with the event in the event parameter table **316** and provided to the transfer client in response to the Read Event method call at step **170**.

Step **202** represents determining whether the file just downloaded should be queued for automatic printing. The event parameters received at step **170** may include an indication that the file should be automatically printed (e.g. print code **357**) and an indication of one of the available printers (e.g. printer **359**). If yes at step **202**, the transfer client **24** executes a local function called Send To Printer at step **204**. The local function retrieves the printer ID from the parameters provided at step **170** and queues the file for the printer.

Following execution of Send to Printer, or upon determining that the downloaded file is not to be sent to a printer, the transfer client **24** determines whether the Event Parameters require renaming the file as represented by decision box **206**.

If yes, step **208** represents the transfer client **24** executing a local process **23** called Rename File. The parameters of Rename File are the old file name and the new file name. The local process **23** renames the file with the old file name to the new file name.

Following renaming of the file at step **208** or following determining that the file is not to be renamed at step **206**, the local process **23** Update Event is again called at step **194**.

Returning to decision box **180**, if the download type is a data processing download, the transfer client **24** executes a local process **23** called Create BLOB. The local process makes a method call to a transfer method **51** operated by the web services server **46**. The transfer method **51** is also called Create BLOB. The local process provides the Session ID **83**, Profile ID **347**, and extract rules **349** as parameters of the method call. In response the web services server **24** will execute its Create Blob Method as discussed with respect to FIG. **16**.

Following the Create BLOB method call, the transfer client **24** waits a time interval, at step **192**, while the web services server **24** executes its Crate Blob Method. If at decision box **192**, the total time elapsed since the Create BLOB method call was made exceeds a threshold, the transfer client effectively aborts the download and proceeds to step **194** where the Update Event function is executed to write a status to the applicable status records of the event parameters table **316** indicating that the event was aborted.

If at decision box **192** the total time elapsed since the Create BLOB method call was made had not exceeded the threshold, the transfer client **24** executes the local Check For Available BLOB function at step **195** (as previously discussed with respect to Step **182**). In response, the web services server **46** returns a BLOB ID if a BLOB meeting the criteria is available and not yet downloaded. Presumably the BLOB was created in response to the Create BLOB method call and is now available.

If no BLOB is available, as determined at decision box **196**, the transfer client **24** returns to step **190** to again wait for a predetermined time interval.

If a BLOB is available at decision box **196**, the transfer client **24** executes the local Download BLOB function at step **198** as previously discussed.

Spawned Upload Process

The flow charts of FIGS. **27***a* and **27***b* represents steps of a spawned upload process **27**. In the exemplary embodiment, the upload process **27** will continually search the upload directory **50***a* for an applicable file and, if the file is located, proceed to steps which upload the file to the web services server. The flow chart of FIG. **27***a* represents the upload process continually searching (e.g polling) the upload directory and the flow chart of FIG. **27***b* represents uploading the file to the web services server **46**.

Decision box **210** represents determining whether a polling time threshold has been exceeded. The spawned upload process **27** will only continue to search the upload directory **50***a* for a limited period of time referred to as the polling time threshold. If this has been exceeded, the polling process is aborted.

If the polling time threshold has not been exceeded at decision box **210**, the polling process determines whether the event has been updated or deleted at step **214**. Determining whether the event has been updated or deleted may include making another Read Event method call to the web services server **46** to determine whether event parameters have been changed or the event deleted. If the event has been updated or deleted, the process is aborted polling process aborts. The event, to the extend updated is processes as a "new" event beginning with step **172** of the flow chart of FIG. **25**.

If the event has not been updated or deleted, the process determines whether the applicable file (as identified by the file name parameter **323** in the event parameter table **316**) exists in the applicable upload directory **50***a* (as identified by the upload directory path parameter **324** in the event parameter table **316**) at decision box **216**. If the file does not exist,

the polling process again returns to decision box **210** to determine whether the polling time threshold has been exceeded. If the file exists at decision box **216**, the transfer client **24** begins execution of an upload process as shown in FIG. **27***b*.

Turning to FIG. **27***b*, step **218** represents calling a local process **23** called Read File to obtain the file from the upload directory **50***a* and step **220** represents calling a local process **23** called Upload File. Upload file makes a method call to a transfer method **51** operated by the web services server **46**. The transfer method **51** is also called Upload File. The local function provides the Session ID **83** and File Name as parameters of the method call. In response, the web services server **46** executes its Upload File Method as discussed with respect to FIG. **19** to obtain the BLOB, store the BLOB in object storage **317** and create an applicable record in the ownership table **62**. The class value **90** is derived from the file name included in the Upload File method call.

Decision box **222** represents determining the upload file process determining the upload file type—which is indicated in a BLOB handling parameter **326** provided at step **170**. If the upload file type is data processing, step **226** represents the execution of a local process **23** called Process BLOB. The local process makes a method call to a transfer method **51** operated by the web services server **46**. The transfer method **51** is also called Process BLOB. The local process provides the Session ID **83**, BLOB ID **89**, and loading rules **327** (from the event parameters table **312**) as parameters of the method call. In response, the web services server **46** executes its Process BLOB Method as discussed with respect to FIG. **21**.

If at decision box **222** the upload type is a message, a determination as to whether a new destination group must be written to the ownership table **62** at step **228**. If yes, step **230** represents execution of a local process called Set Destination BLOB Owner. The local process makes a method call to a transfer method **51** operated by the web services server **46**. The transfer method **51** is also called Set Destination BLOB Owner. The local process provides the Session ID **83**, BLOB ID **89**, and destination group ID **325** as parameters of the method call. In response, the web services server **46** executes its Set Destination BLOB Owner Method as discussed with respect to FIG. **20**.

Step **232**, represents executing the Update Event local function as previously discussed to indicate that the event is complete.

Step **234** represents execution of a local function called Rename File for purposes of renaming and moving the file from the upload directory **50***a* to a unique file name (such as the original file name combined with a time stamp at which the rename occurred) within a processed files directory **52***a*.

Audit Log

FIG. **28** represents an exemplary audit log tables **312** which may include a plurality of audit logs **340***a*-**340***c*—one for each transfer client **24**. Each audit log **340** comprises a plurality of records **322**, each representing a recorded audit event. The fields of the audit log **340** comprise a date field **341**, a time field **346**, a method called field **348**, and a parameters passed field **350**.

The date field **341** and the time field **346** establish the date and time at which the record **342** was written to the audit log table **84**. The method called field identifies the transfer method **51** that was called and the parameters passed field **350** contains the parameters included in the method call. Each method called is logged in the audit table **312**.

Back End Server

In the exemplary embodiment, the back end server application **38** interacts with the web services server in the same manner as the transfer client **24**. More specifically, the back end server application **38** may include a transfer client **24** for making method calls to the transfer methods **51** to (as discussed with respect to FIGS. **9** through **21**) for obtaining files stored in the object storage **317** by another system and placing objects in the object storage **317** for retrieval by other systems.

In another embodiment, the back end application server **38** may obtain the object directly from the database **40**. FIGS. **29***a* and **29***b* represent operation of the back end server application **38** obtaining object from, and putting objects to, the database **40**.

Referring to FIG. **29***a*, step **392** represents the occurrence of an event wherein the back end server application **38** will attempt to obtain a binary object from the object storage **317** of the database **40**. Such events may be any events generated internally and applicable to the data processing functions of the back end server application **38**.

Step **394** represents accessing the ownership table **62** to determine whether an object with applicable ownership information exists in the object storage **317**. If not, there is no object to retrieve. If an object in the object storage **317** matches the ownership information, the back end application server **38** obtains the location of the object form the ownership table **62** and obtains the object at step **396**.

Referring to FIG. **29***b*, step **406** represents the occurrence of an event wherein the back end server application **38** will put a binary object into the object storage **317** of the database **40**. Again, such events may be any events generated internally and applicable to the data processing functions of the back end server application **38**.

Step **408** represents writing the object to the object storage **317** in the database **40**. Steps **409** and **411** represent adding a record to the message table **62** and writing the location of the object within the object storage **317** and the ownership information to the newly created record.

It should be appreciated that the above described systems provide for unattended transfer of files over an open network between two unattended application such as the business process application server **18** and either the data processing module **55** of the web services server **46** or the back end application server **38**.

It should also be appreciated that such transfer is facilitated by a self installing remote transfer client thereby eliminating the need for cumbersome FTP solutions.

Although the invention has been shown and described with respect to certain preferred embodiments, it is obvious that equivalents and modifications will occur to others skilled in the art upon the reading and understanding of the specification. It is envisioned that after reading and understanding the present invention those skilled in the art may envision other processing states, events, and processing steps to further the objectives of the modular multi-media communication management system of the present invention. The present invention includes all such equivalents and modifications, and is limited only by the scope of the following claims.

What is claimed is:

1. A web services transfer server for exchanging files with a transfer client over an open network, the web services transfer server comprising:

a processor executing a plurality of transfer methods coded to computer readable medium, the transfer methods comprising:

a log-on method operated in response to receiving a log-on method call from the transfer client, the log-on method call comprising a user ID and authentication credentials of the transfer client, the log-on method

comprising steps for, if the authentication credentials match those of an authorized transfer client:

i) generating a session ID for assignment to the transfer client;

ii) writing the session ID to a session ID field of a record of a user ID table associated with the transfer client; and

iii) returning the session ID to the transfer client;

a retrieve active event key method operated in response to receiving a retrieve active event key method call from the transfer client, the retrieve active event key method call comprising the session ID, the event key method comprising steps for:

i) retrieving the user ID associated with the session ID from the user ID table;

ii) retrieving an event key value associated with the user ID from an event key table; and

iii) providing the event key value to the transfer client;

a read event method operated in response to receiving a read event method call from the transfer client, the read event method call comprising the session ID and the event key value, the read event method comprising steps for:

i) retrieving event parameters associated with the event key in an even parameter table, the event parameters comprising identification of a file and rules for creating a binary object; and

ii) returning the event parameters to the transfer client;

a create binary object method operated in response to receiving a create binary object method call from the transfer client, the create binary object method call comprising the session ID and the rules for creating a binary object, the create binary object method comprises steps for:

i) calling a data processing function for extracting data from an application database and formatting the data into a file in accordance with the rules;

ii) storing the file as a binary object in an object storage;

iii) creating a record in an ownership table associating the binary object with a class value and identification of the binary object, and

iv) returning the class value to the transfer client;

a check availability method operated in response to receiving a check availably method call from the transfer client, the check availability method call comprising the session ID and the class value, the check availability method comprising steps for:

i) comparing the class value to each record of the ownership table to determining if the binary object with its class value matching the class value provided in the method call exits; and

ii) returning a binary object ID identifying the binary object;

a download method operated in response to receiving an download method call from the transfer client, the download method call comprising the session ID and the binary object ID, the download method comprising steps for providing a response message to the transfer client, the response message comprising the binary contents of the binary object associated with the binary object ID.

2. The web services transfer server of claim **1**, wherein the event parameters further identify a download directory associated with the transfer client to which the binary object is to be stored as a file with the file name.

3. The web services transfer server of claim **2**, wherein the event parameters further comprise a printer ID of a printer associated with the transfer client and to which the transfer client is to send the file following download.

4. A method of operating a web service server for exchanging files with a transfer client over an open network, the method comprising:

operating a log-on method in response to receiving a log-on method call from the transfer client, the log-on method call comprising a user ID and authentication credentials of the transfer client, the log-on method comprising steps for, if the authentication credentials match those of an authorized transfer client:

i) generating a session ID for assignment to the transfer client;

ii) writing the session ID to a session ID field of a record of a user ID table associated with the transfer client; and

iii) returning the session ID to the transfer client;

operating a retrieve active event key method in response to receiving a retrieve active event key method call from the transfer client, the retrieve active event key method call comprising the session ID, the event key method comprising steps for:

i) retrieving the user ID associated with the session ID from the user ID table;

ii) retrieving an event key value associated with the user ID from an event key table; and

iii) providing the event key value to the transfer client;

operating a read event method in response to receiving a read event method call from the transfer client, the read event method call comprising the session ID and the event key value, the read event method comprising steps for:

i) retrieving event parameters associated with the event key in an event parameter table, the event parameters comprising identification of a file and rules for creating a binary object; and

ii) returning the event parameters to the transfer client;

operating a create binary object method in response to receiving a create binary object method call from the transfer client, the create binary object method call comprising the session ID and the rules for creating a binary object, the create binary object method comprises steps for:

i) calling a data processing function for extracting data from an application database and formatting the data into a file in accordance with the rules;

ii) storing the file as a binary object in an object storage;

iii) creating a record in an ownership table associating the binary object with a class value and identification of the binary object, and

iv) returning the class value to the transfer client;

operating a check availability method in response to receiving a check availably method call from the transfer client, the check availability method call comprising the session ID and the class value, the check availability method comprising steps for:

i) comparing the class value to each record of the ownership table to determine if the binary object with its class value matching the class value provided in the method call exists; and

ii) returning a binary object ID identifying the binary object;

operating a download method in response to receiving an download method call from the transfer client, the download method call comprising the session ID and the binary object ID, the download method comprising steps for providing a response message to the transfer client, the response message comprising the binary contents of the binary object associated with the binary object ID.

5. The method of claim **4**, wherein the event parameters further identify a download directory associated with the transfer client to which the binary object is to be stored as a file with the file name.

6. The method of claim **5**, wherein the event parameters further comprise a printer ID of a printer associated with the transfer client and to which the transfer client is to send the file following download.

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